DOCUMENT RESUME

ED 334 938 HE 024 782

AUTHOR Hansen, Edmund; And Others
TITLE Computer Conferencing for Collaborative Learning in Large College Classes. Final Report of a Grant Project Conducted by the Division.
INSTITUTION Indiana Univ., Bloomington.
SPONS AGENCY Telecommunications Advancement Foundation, Tokyo (Japan).
PUB DATE Aug 91
NOTE 69p.
PUB TYPE Reports - Evaluative/Feasibility (142) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Computer Assisted Instruction; Computer Networks; Computer Oriented Programs; Computer Software; *Computer Uses in Education; *Electronic Mail; Higher Education; Large Group Instruction; Program Evaluation; State Universities; *Teleconferencing
IDENTIFIERS *Indiana University Bloomington

ABSTRACT

This project sought to explore the educational potential of three models of a University of Indiana computer conferencing technology in facilitating collaborative learning and enhancing social interaction in instructional contexts that provide limited face-to-face contact among the students. The study examined each of the three models of computer conferencing technology, one which allowed class discussion to continue beyond regular class time, one which permitted students to share individual and group project products in preparation for further discussion, and a third which allowed for collaborative test preparation. By examining the products generated in the conferencing medium, and by looking at the classroom process itself, the study found that instructors had increased their use of interactive conferencing to post announcements, grades and so on, and that students took to "e-mail" or electronic mail quite easily but did not favor the Electronic Classroom citing access problems, and awkward software applications. However, in instances where EC was successful, there was less student anonymity, and greater class participation. These instances of success came about through instructor support of the technology, through appropriate course structuring, and with careful modeling of use on the part of the instructor. The report includes 18 references and 9 appendixes which contain survey instruments and details of the study data. (JB)

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"COMPUTER CONFERENCING FOR COLLABORATIVE LEARNING IN LARGE COLLEGE CLASSES"

Final Report of a Grant Project
Conducted by the
Division of Development and Special Projects, Indiana University,
Sponsored by the
Telecommunications Advancement Foundation, Japan.

by:

Edmund Hansen, Buck Brown, Siat-Moy Chong, Kenichi Kubota,
Nancy Totten, and Lori Hubbard

Indiana University
August 1991

HE 024 782

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Acknowledgments

We would like to express our appreciation to the faculty members who graciously volunteered their time and energy to this project. All of us who visited their classes and discussed the underlying teaching rationales have gained tremendously from the expertise and engagement with which these instructors went about their daily business. One of the recurring topics in this paper is that large research universities tend to direct their faculty's interest toward publications and away from their students. If this is so, we were fortunate enough to have worked with instructors who are exceptions to the rule. They experimented with new instructional approaches that not only required extra preparation time, but also included the risk of having to question previous beliefs of what works. Under such circumstances, not everything succeeds during the first attempt. If some of our analysis might sound critical at times, it is not critical of the teachers, but of the new pedagogical and technological models that need to be further developed from their present experimental stage. The instructors who allowed us to observe or work with them, are pioneers in this area, at least at Indiana University, and deserve our sincere gratitude.

We would also like to thank the Telecommunications Advancement Foundation in Tokyo/Japan for their generous support of this project. We hope that their first venture abroad encourages them to support similar projects here in the future.

INTRODUCTION:

Higher education is currently undergoing its most significant changes in decades. Student populations are shifting from young students right out of high school to older students who have been in the workplace for many years; college classes are becoming larger as a result of decreased public funding allowing for fewer instructors (The Chronicle of Higher Education, Jan. 9, 1991); and a significant shortage of faculty is predicted for the current decade (The Chronicle of Higher Education, Sept. 18, 1989; July 11, 1990). At the same time, universities are turning out degrees in record numbers. National studies of higher education have been critical, however, claiming that these degree programs have failed to develop students' critical thinking skills and social values (AAC-report, Jan. 1991; Carnegie Foundation report, 1987).

Faculty and instructional developers are exploring how instructional strategies and new educational technologies can contribute to solving these problems. There is evidence that the use of collaborative learning with the concomitant development of a supportive social environment can revitalize the classroom process for both teachers and learners (Gabelnick, a.o., 1990; Gamson, a.o., 1984; Svinicki, 1990). Special grouping procedures can be used to break up large classes and supplement lectures with highly interactive activities (Barrows, a.o., 1986; Brothen, 1986; Gleason-Weimer, 1987; McGee, 1986; Michaelsen, 1983), and new computer technology can contribute to a social infrastructure that allows instructors and students to distribute initiatives for the learning process in more democratic and reflective ways (Adams, Carlson & Hamm, 1990; Feenberg, 1989; Galegher, Kraut, & Egido, 1990; Harasim, 1990; Mason & Kaye, 1989).

For the last four years, Indiana University has been offering its instructors an electronic conferencing utility that has potential for contributing to the creation of such new learning and communication patterns. Currently, 54 instructors (= 2% of all Bloomington faculty) are using this utility for a total of 71 classes. The system can be accessed from 35 computer clusters with a total of about 700 networked PC's and Macs across the campus, as well as via modem from work stations in offices or at home.

An electronic conference (or "Electronic Classroom") is a computerized bulletin board that allows its users to post messages for other participants to read and reply to. Each class is given a separate conference, in some cases, more than one, under its course and section number (see Appendix A). It is usually left to the instructor to structure and monitor the exchanges in the bulletin board. With no given space limitations, material can be added as the need arises.

Conferences are structured in topics and replies. Topics are usually (but not necessarily) posted by the instructor. Students respond to these topics on a secondary, so-called reply level. The software used on IU's VAX computers ("VAX-Notes") features a strictly hierarchical system. Topics can be entered only in ascending sequence, as can replies. The software does not provide flexibility for online resequencing or for attaching a reply directly to another one, unless the user happens to be the next in line to enter a comment under the respective topic.

Since entries within a conference can become numerous and lengthy, keywords may be used to search through a conference. It is possible to extract individual notes or the whole conference for printing purposes, and it is also possible to up- and download conference files so that they can be worked on offline if users want to compose or edit text files on their personal computer.

PURPOSE OF THIS PROJECT:

In our project we set out to explore the educational potential of the computer conferencing technology in college teaching. More specifically, the goal was to investigate how computer conferencing may facilitate collaborative learning and enhance social interaction in instructional contexts that provide limited face-to-face contact among the students. First of all, this relates to large college classes whose high enrollment does not allow students to get to know each other and engage in meaningful discussions. In addition, we have been able to include a course that was taught on two campuses of Indiana University simultaneously via two-way television broadcast.

Considering the relative novelty of the medium and the traditional nature of most university teaching, the project had two additional objectives. Few faculty members at Indiana University are using computer conferencing for their classes, and even fewer are using it in an instructional context that has as an explicit goal the support of student-centered, collaborative forms of learning. The two additional goals of the project therefore involved the propagation of (a) collaborative learning/teaching approaches, and (b) the computer conferencing medium as a catalyst for such approaches.

METHODOLOGICAL APPROACH:

We developed different methods and strategies to accomplish our goals of not only evaluating but also propagating the new technology and teaching approaches. The objectives of adoption and diffusion were supported by strategies at the local and the national levels. Events and publications were initiated for both. The main idea was to create a few model applications of collaboration and computer conferencing that would serve as case studies. Other faculty at IU and elsewhere could thus examine concrete examples of a technologically and pedagogically enhanced learning/teaching environment. They would receive a realistic estimate of what it would take to incorporate such changes into their own classrooms: the time requirements, the rewards, and the problems.

The research and evaluation goals of the project were addressed by two major strategies. The first strategy was to examine the products generated in the conferencing medium, and the second was to look at the classroom process itself and evaluate how the medium was related to this process.

The classroom process was observed by research assistants, who focused their attention on interactive activities during lectures, the instructor's general teaching approach, and the integration of content from the electronic conference into the classroom teaching. Students and instructors were surveyed about their experiences and feelings toward the technology and the overall dynamics of the class.

The pedagogical dynamics of the electronic conferences were analyzed according to criteria such as:

* How did students use the as yet relatively undefined parameters of the EC?
* Which effect did the EC have on the class climate?
* How was the EC integrated into the whole course?
* How much interaction was generated by the EC?
* What was the development of EC-use over the course of a semester?
* Which aspects of the medium's potential were left unutilized in a given application?
* Given the current pedagogical, financial, and political realities at our universities, what is the medium likely to achieve in the near future?
* How do face-to-face and electronic collaboration complement each other?

RESULTS:

A. Activities for Adoption and Diffusion:

Faculty members at Indiana University were involved in a variety of activities promoting the use of the electronic conferencing technology and the collaborative learning/teaching approach. Since little was known of either of these novel pedagogical and technological concepts at the start of our project, we planned a university-wide conference to introduce faculty on the different IU campuses to them. The conference extended over two days, with the first day focusing on collaborative teaching approaches and the second day highlighting the role of technology in supporting such approaches (see Appendix B). It featured two nationally known experts as keynote speakers and 60 instructors from six IU campuses as presenters and panelists. More than 150 instructors and students attended the conference, and their response was overwhelmingly positive.

The conference also raised interest in the electronic medium, and our most comprehensive case study (see "Model C") can be attributed largely to its influence. Two Brown Bag Luncheons devoted exclusively to discussing the use of computer conferencing in creating more collaborative classrooms followed. These meetings were attended by about 10 faculty members from different disciplines each time. Such interdisciplinary discussions about teaching and technology are a rare event on campus. On both occasions, the emphasis was on conceptual ideas concerning the medium. The second meeting had been prepared by an electronic conference linking the most active EC users in a debate. The topics of that debate (see Appendix C) were originally designed to provide a framework for a "pedagogical front-end" or

a "teachers manual" to electronic conferencing and student-centered learning activities. It turned out, however, that too few instructors had sufficient experience with such activities at that point to be able to sustain such a debate.

At the end of the second semester of the project, we mailed out a questionnaire to 54 faculty members who had been or currently were using an electronic conference for one or more of their courses (see Appendix D). Twenty-two instructors returned the questionnaire, and we solicited 15 more responses through phone interviews. The results of this survey are reported in a later chapter. Summaries of the survey together with other instructional materials will be sent to all EC instructors later this summer, to increase their sense of working as innovators and to further distribute the concepts that have guided our project.

Our efforts to reach audiences on a national and international level include a presentation at the national conference of the Association for Educational Communications and Technology (AECT) in Orlando, Florida in February 1991. The paper written for this conference was also submitted for publication to the American Journal for Distance Education. The proceedings of our own conference on collaborative learning in higher education have been edited and will be made available through the Educational Resources Information Center (ERIC) shortly. Our final project report will also be available through ERIC and through an international electronic network of scholars in telecommunications ("Comserve").

B. Activities to evaluate the medium's potential:

Computer conferencing has been used for a variety of interactive learning purposes in college classes at IU, including electronic class discussions, journal writing, literature reviews, critiquing of proposal drafts, prolonged interaction with guest lecturers, etc. Large classes (of over 50 and often times several hundred students) create special limitations for what is feasible in this medium. Appropriate forms of feedback, whether by instructor or peers, become more difficult as student numbers increase, and the danger of information overload can jeopardize any positive intentions. Within the context of our project, instructors have worked with variations of three basic models of computer conferencing. In the following, each of these models will be investigated separately.

Research on Model A: Ongoing Discussion Topics

The first model involves the electronic medium as an extension of the classroom. The opportunities for students in large classes to participate in a discussion are very limited. Lectures typically cover vast amounts of course content that is the basis for student assessment. This restricts them, in many cases, to the transmission of factual knowledge that is easily testable in multiple-choice exams. The deeper issues of a subject matter which rarely have a right or wrong answer, are often left untouched. Some instructors have therefore used the Electronic Classroom to create additional opportunities for discussion, oftentimes to deal with topics that could not or could only partially be addressed during regular class time. The

instructors we observed used computer conferencing to incorporate more debates over these more complex issues into their courses.

Variation 1:

"Computer Literacy A200" is a computer science class for non-majors. The enrollment for the past spring semester was 317 students, predominantly undergraduates from fields such as the humanities, the sciences, business, education, and library science. Less than 10 percent are graduate and continuing students. The course is divided into a one-hour lecture and small-group lab sections, which meet twice a week. The various lab sections are led by teaching assistants and provide demonstrations and hands-on experience with the main course concepts and computer software such as wordprocessing, database, spreadsheet, operating systems, and communication networks. Lab assignments and overall class work account each for 50 percent of the grade.

The lecture portion of the course is taught by an adjunct faculty member, a Ph.D. student whose open style and enthusiasm for her students and the subject matter have earned her recognition from students and department alike. She intentionally avoids a straight lecture style and organizes her weekly sessions around topics that provoke student discussion. The topics deal mostly with the social impact of computers and include issues such as computers and history, computers and ethics, computers and persuasion, and computers and privacy. The goal is to provide a forum for sensitizing students' awareness of the positive and negative potentials of the technology. Whereas the lab sessions are mostly devoted to the development of technical skills, the lecture focuses on the development of concepts and socially responsible judgment.

Students' work in the lecture portion of the course is evaluated through a midterm, a final exam, a paper, and a participation grade. Both the midterm and the final exam are comprised of multiple choice, short-answer, and essay questions that reflect the issues discussed in class. Participation grades are assigned according to the frequency with which students get involved in class discussions or in Electronic Classroom debates.

The Electronic Classroom provides a secondary forum, besides the live classroom, for addressing the ethical issues that surround the increasing computerization of many areas of our social life. Although the open lecture-discussion format of the instructor usually yields lively participation from students throughout the large lecture hall, only a fraction of the total class is able to voice its opinions during class time. The Electronic Classroom is therefore an appropriate instrument to draw those who do not have a chance to speak in class into the discussion. It also serves an additional purpose that the instructor stressed frequently in our interviews with her: the electronic medium contributes to providing a sense of community within this large number of students. Giving everyone the opportunity to publish his or her opinion on a topic of common interest represents a first step toward overcoming silence and anonymity.

Beginning in the fifth week of the semester, the instructor inserted ten discussion topics

over the course of the next 11 weeks, at irregular intervals. The list of topics is as follows:

1. Technology & the Media in the Persian Gulf War	(71 replies)
2. Ethics and Morals: Is there a Difference?	(62 replies)
3. Ethical Constructs for Telecommunications	(69 replies)
4. Software Piracy and Ethics	(28 replies)
5. Abusing Computer Privileges	(50 replies)
6. Intellectual Property	(50 replies)
7. Computer Myths	(100 replies)
8. Lifestyle Information vs. Factual Information	(40 replies)
9. "Can you get out of the computer?"	(30 replies)
10. Long Privacy Article	(24 replies)

In the following we want to take a closer look at students' use of this Electronic Classroom. For a closer analysis, we have selected three of the ten topics: the first topic, a topic in the middle (#4), and a topic toward the end (#8), to account for possible changes in response patterns across the semester. In addition, these topics also yielded a high-, medium-, and a low-frequency response rate by the students, and may thus be representative for different degrees of student interest in the topics.

The criteria we are using to describe these comments are primarily derived from our own and the literature's assessment of the medium's potential. They overlap only partially with criteria stated by the instructor for evaluating her students or the success of this instructional tool. Since the medium played only a minor role in the evaluation of student performance, our own analysis of students' entries will obviously be more rigorous than would be adequate strictly from the point of view of their relevance for this particular class. The intent is to investigate the medium's potential based on current institutional limitations, not to judge its actual use in any given course.

Students' entries in the 10 topics of this EC are on average about 12 lines long, i.e., three quarters of the available screen. The longer entries cover two screens. It is the exception if the same student responds to any given topic with more than one reply. For example, in topic #1, only four students give multiple responses, two responding twice, one responding three times, and the last four times. In one of the shorter topics, number 4, only one student enters two comments. In topic #8, no student enters the discussion more than once. In fact, throughout the semester, a student responds more than once within the same topic only 18 times. Students did not follow the instructor's guidelines for "pursuing an issue until some resolution or consensus has occurred," i.e., to engage in a debate format that would have required them to repeatedly argue their point against other opinions.

Another potential indicator that we used to assess the nature of student interaction within the EC is the number of different arguments, perspectives, or insights yielded by each topic. Again looking at the three sample topics, at best, the topics yield approximately one new argument or insight for every two entries (Topic 4: 12 in 28; Topic 8: 18 in 40). The Gulf War

topic shows an even lower ratio (22 in 71 responses). This may reflect the media blitz that was in progress when the question was open for discussion. Students were likely swayed in their viewpoints by what they had been hearing and reading, most of which lent itself more for convergent than divergent opinions. Generally, students did not seem to make an effort to be original, or to avoid repeating what had already been said. Oftentimes it seemed they had not bothered to read the replies entered by their peers, an impression that is further supported by data from the student questionnaire (Appendix E).

The number of comments that deviate from the majority position and their impact on the responses that follow them provide another means of assessing the degree of involvement among the students. Among our three sample topics, the Gulf War topic was the most productive, with 10 dissenting comments offered or seconded by 26 respondents. The topic concerning the release of factual and so-called "lifestyle" demographic information to advertisers, landlords, and other interested parties yielded 6 dissenting comments, offered by 6 respondents; and the topic on the ethics of software piracy resulted in only one dissenting comment.

The consequences of these dissenting comments for the entries that followed are more difficult to evaluate, since students rarely made specific references to previous notes. In the Gulf War topic we found one possible indication that a dissenting viewpoint might have "broken the ice" for other respondents, when five consecutive dissenting replies followed a string of otherwise mainstream statements. There is no evidence in the rest of the topic, nor in the other two topics, however, that dissenters sparked any controversy among those that followed them or encouraged the offering of other unique viewpoints.

A similar picture emerges from examination of the instances where students actually refer to someone else's comment in their own note. These references express either agreement with the earlier comment, criticism of the respondent of failing to stick to the appointed topic, or, in a single case, a summary of arguments thus far with an encouragement for further respondents to go in a different direction. In the three topics examined, these references occurred only four to seven times per topic.

The citing of "hard evidence" by the students to support their opinions is equally rare. In the Gulf War topic, only three students referred to outside sources of information or facts that they were obviously bringing in from elsewhere. The same holds for the Software Piracy and the Lifestyle-vs-Factual-Info topics. None of the evidence appeared to be the result of research or outside readings.

These data seem to indicate that the students did not view the EC as a resource for discussion, but rather as a place to express their personal opinions, and, if they were interested, to read the opinions of others. The element of debate is definitely missing. Very few students enter a topic more than once; the ratio of new arguments per topic entries is low, and so is the number of comments that deviate from the majority position; there is little evidence of controversy sparked by dissenters; few direct references to other entries; and little citing of

supporting evidence for one's opinions.

This overall impression is supported by responses from a questionnaire which was completed in class by 143 students three weeks before the end of the semester (see Appendix E). The fact that only 45 percent of the total class filled out the questionnaire adequately represents student attrition from lecture attendance toward the end of the semester (which is not atypical for large undergraduate classes). It can be assumed that those still coming to lectures constitute a biased sample of students that are more motivated than the rest. Their activities in the EC also seem significantly higher than average. Twenty-seven percent admitted to never having written a response in the EC, compared to a total of 58% of the whole class identified as never having entered a comment under any of the 10 discussion topics.

Given the likelihood of a positive bias among these respondents, it is noteworthy that their self-reports of how they used the EC still include some obvious criticism. Twenty percent of the 143 respondents admit to entering their comments only for the sake of receiving participation points. Thirty-nine percent state they have read a response in the EC only two times or fewer over the course of the semester. Fifty-one percent criticize the redundancy of many entries.

Focusing only on the EC-medium and its potential for fostering debate, the analysis suggests that students in this class did not measure up to our criteria of collaborative learning through computer conferencing. Such a narrow conclusion, however, would be unfair to the course whose instructor used a variety of means to encourage student interaction. Writing comments in the EC was only one way of fulfilling the participation requirements of the course. It accounted for only 5 percent of the total course grade. This is not a strong incentive for many undergraduate students who are not worried about competing for top grades. Most young students still prefer their feedback direct from the instructor rather than relying on their peers. The instructor went to great lengths providing such feedback in her other assignments, far more than can normally be expected in such a large class. For each student she graded a paper and two exams that included essay questions. The personalized feedback to these assignments, together with the work in the smaller lab sessions, the discussion-oriented lectures, and the instructor's constant availability through electronic mail significantly reduced the anonymity factor in this class. Thus, the EC was only one of many means through which students were reassured that they counted as individual members of a larger community. Had these circumstances been different, the EC could have taken on a more active role in developing such a sense of community and interaction. An instructor with less time or resources to put into personalized feedback and direct student involvement in a large lecture might organize the EC more specifically to compensate for some of the loss of direct classroom interaction. Elements of such an organization of the EC will be outlined later.

Variation 2:

"Sociology of Work, S315" is a sociology class that attracts majors from the College of Arts and Sciences and the business school. The course usually has an enrollment of about 100

students, but this past semester the class had only 56 students. This might have been related to the rather stringent course requirements of four exams and a class project, to which the instructor added mandatory test preparation using the Electronic Classroom (see "Model C"). The course addresses issues such as early history of the workplace, social contexts of work and their effects, effects of occupational associations, global change, new technologies, and high versus low skilled workers. It was designed as a lecture format complemented by occasional small-group work, class discussion, short in-class writing ("minute papers"), guest lecturers, and some films.

The instructor was interested in establishing a parallel between the formal organization of student learning and the course content, i.e., the world of work. Collaboration and team work are of increasing importance in both contexts. Thus, the instructor was eager to create new structures in his class that mirrored the collaborative work approaches found in the "real" world. A presentation at the conference on Collaborative Learning in Higher Education introduced him to a model of collaborative test preparation that seemed to fit his needs. It also provided him with a first look at the potential of computer conferencing for collaborative learning. When we later discussed a combination of the two approaches with him, he agreed to test them in his class and soon became very engaged in all aspects of this experiment.

In addition to the use of the EC for test preparation, we decided to incorporate some complementary functions of the medium. We created several generic topics that we felt would help students learn to express their opinions on multiple levels. The number of topics grew over time and resulted in the following list:

1. Students' Self-Introductions
2. EC Technical Assist Shop
3. Questions Before & After an Exam
4. Informal "Coffee House"
5. Can you explain what ... means?
6. The Opinion Page
7. About Current Readings Assigned
8. Class Suggestion Box
9. About Collaborative Learning
10. About My Class Project

Some of the smaller topics are not listed here because most of them served administrative purposes.

The nature of these topics was different from the discussion topics in the computer science class. Instead of issues for debate and discussion, this EC simply provided categories of notes under which students could enter their comments. Each topic-category had a different function. Some of them were directed at fellow students (the Coffee House, the Opinion Page, the Self-Introductions); others were addressed more to the instructor (Questions Before/After an Exam, the Class Suggestion Box, Can you explain...); the remainder was for both instructor and

fellow students to read and respond to (the Opinion Page, Collaborative Learning, the Class Project, EC Technical Assist). These distinctions in audience were not predefined; they rather emerged gradually, as did the patterns in which students entered their comments over time.

The EC was opened in week 3 of the semester. Its usage followed a predictable bimodal curve with peaks shortly before the spring break and three to four weeks before the end of the semester. The Coffee House, with 150 entries, was the most heavily used topic, although it only comprised one third of the total entries. This figure is relevant, considering that weekly entries under any one topic were mandatory for participation credit, and the Coffee House was certainly the "easiest" topic to choose. Most of the topics peaked at 7 or 8 entries during one or two weeks of their existence. The Collaborative Learning topic reached 17 entries during its first week and tapered off after 9 entries in its third week. The topic about students' class projects received 14-16 entries in the three weeks before the projects were due. Only the Coffee House generated high levels of interest among the students for an extended period of time, a total of seven weeks, in two installments, during which it was frequented by 13-23 people each week.

The instructor exercised considerable self-constraint in his comments. Although he monitored the conference several times a day, he did not enter the discussion unless it was necessary. Even in a topic such as "Can you explain what... means?" he usually waited for another student to give an answer first. If his expertise was requested, however, he always responded promptly. This style of close but restrained monitoring was important in order for the students to recognize that this medium was theirs to use, but that at the same time their comments were heard and taken seriously by the instructor. Whenever possible, the instructor incorporated student suggestions into the course to give students a sense of ownership and encourage participation. In our interviews with him, he stressed how helpful the medium was in providing him with new insights into his students' thinking, saying that he now saw his students as more serious in their goals and efforts than he did formerly.

In a study of the transcripts of the EC in this course, the topics that stand out the most are the Coffee House and the Opinion Page. The Coffee House was an experiment stimulated by Linda Harasim's emphasis on the social-motivational aspects of electronic communication.[1] Since even a comment of the most informal nature in the Coffee House earned the students points, it is difficult to determine the degree to which this informal forum fulfilled a need among the students. Considering the fact that with 56 students the class turned out to be much smaller than originally expected, and considering that many students worked in small groups in and outside of the classroom, this type of outlet might not have been as important for students as it could have been under different circumstances.

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[1]see her keynote address "Computer-Supported Collaborative Education" in E. Hansen, a.o. (Eds.), (1991). Proceedings of the Teaching Conference on Collaborative Learning in Higher Education, Oct. 1990, ERIC document.

A total of 38 students entered comments in the Coffee House. Sixty-one of these comments could be considered announcements (with or without questions); 73 were classified as replies to these announcements. Further analysis generates the following subtopics:

1. Sports (baseball & basketball)	-- 20 notes
2. Special events (recreation)	-- 21 notes
3. Jokes	-- 5 notes
4. Apartment sublets	-- 8 notes
5. Sightseeing for a foreign classmate's parents	-- 10 notes
6. Medical horror stories (started in class)	-- 8 notes
7. Comments addressed to one partic. classmate	-- 27 notes
8. Specific questions to anyone in class	-- 8 notes
9. General announcements	-- 5 notes
10. Movies (mostly relating to class topics)	-- 9 notes
11. Class suggestions/discussions about class	-- 16 notes
12. The University's change of tuition policy	-- 9 notes

Another, related topic was dealt with separately. As a preliminary activity in the electronic classroom, each student was asked to write one screen full of a self-introduction. This exercise was unusually informative. Students revealed a significant amount of meaningful information about themselves, probably because the instructor had explicitly requested "one screen full" and the graduate assistant of the course had established a model by starting with a thorough introduction of himself. Other EC's on campus that have asked students for self-introductions have never been very productive, presumably because the expectation was not modeled carefully.

Notes in the Coffee House fluctuated between being serious and a more chatty tone. There was a general turn toward more serious comments about eleven or twelve weeks into the semester. Considerable discussion focused on the University's proposal of a flat fee tuition and on stories of medical malpractice, based on personal experience or news reports. Many people seemed to tire of the casual, conversational replies--baseball, weekend fun, etc.--by the end of the semester.

We had not been clear about what this topic should accomplish. Since many students used it to fulfill their participation requirement, it oftentimes read like a series of postcards mailed to friends, revealing tidbits of one's current mood, chatting about vacation plans, wishing others good luck on the next exam, etc. Occasionally, however, there were signs of other functions that might be more productive in creating social cohesion in a classroom. A few students asked classmates for help on class-related or unrelated activities; others tried to arrange an informal get-together after class; one student was looking for advice from someone with the same major as herself. Some students got involved in discussing current University politics or local events; nobody dared to extend such discussions to general politics. Some people expressed their opinions about certain aspects of their class; others informed the class of special events or other things of interest. The need to tell stories or simply to gossip was also visible

now and then. It may take some time and cautious modeling from the instructor (or select class members) for students to develop a better sense for the potential of such informal forums that, after all, have previously been unavailable to them in a classroom.

The biggest contrast to the Coffee House was the Opinion Page topic. It started as one student's initiative--a debate of labor-management relations--and resulted in 39 more notes over the course of the semester. The original topic brought up by this student proved to be most fruitful for the discussion, in which every entry built upon a previous note. Eventually other topics branched off, although none was as successful as the first one. Overall, the Opinion Page was probably the best example of how the medium can enrich the course content:
(1) It functioned as an extension of the class discussion. For those who could not get into the live class discussion, or were hesitant to do so, this was the perfect forum to contribute some pertinent ideas to the issues at hand.
(2) It allowed for and encouraged a synthesis of course materials with students' experiences in the outside world. Relating theory to practice requires time for reflection. The written medium of the EC provided the opportunity for students to thoughtfully relate what they had experienced themselves on a job, or what they had picked up in the papers or from TV, to what they heard and read about in class.

It may seem somewhat surprising that students' attitudes toward the EC were rather negative. Among eight main instructional elements in class, the EC was ranked lowest by the students. The mandated weekly participation in the EC was seen by many students to be relatively unproductive. Being awarded participation points for leaving a note in the Coffee House was seen as particularly inappropriate, or even as an indicator that people were rewarded for doing busy work.

The students' negative evaluation of the weekly EC use can be explained by several factors:

(1) The medium was new to most students, and like most other innovations required some getting used to, especially in finding out--together with the instructor--what the most productive activities are under various topic options (see Coffee House example).

(2) The course had above-average requirements. Therefore, everything that did not seem absolutely essential to the final grade was rejected or given low priority.

(3) A large number of students had insufficient access to computers. Having to wait in line in a public computer cluster or make extra trips to campus to do the weekly logon turns communicating via computer into a chore rather than a convenience. One of the medium's greatest assets, its potential to facilitate reflection by allowing the user to engage in a discussion at his or her leisure, was virtually eliminated by the students' limited access to computers. By logging on only once a week, students were likely faced with information overload, so that they were deprived of the chance to take time to reflect about their response before typing it in.

Research on Model B: Work on Case Studies

Model B uses the electronic conference as a bulletin board to publish the products of individuals and groups in preparation for further discussion face-to-face. The logistics of sharing written information becomes a complicated (and costly) problem in large classes. At the same time, such classes offer the opportunity for comparing opinions and interpretations that, by virtue of their number, approach almost demographic proportions. One way to exploit this opportunity is in conjunction with the case study approach to teaching. Students analyze relevant case scenarios on their own and then use the multiple viewpoints generated by the whole class as stimuli for further discussion.

Model B was applied to an undergraduate course in special education (K205: Introduction to Exceptional Children) with an enrollment of 125 students, mostly sophomores and juniors. The course is taught by a senior faculty member, who has no teaching assistants for the class. In the past, these circumstances have limited the professor to a straight lecture format that provided little student interaction.

The instructor's motivation for experimenting with a new teaching approach derived largely from her desire to modify the students' attitudes toward people with special needs. This population includes the physically and mentally handicapped and the socially or emotionally maladjusted, as well as people who are exceptionally gifted. The instructor suggested that having students work on cases might be an appropriate way to deepen their awareness and develop their critical judgment relative to the complex issues facing society in its treatment of these special populations.

The need to develop the students' analytical skills and their ability to construct logical arguments were additional motivations for trying a case study approach. Authentic cases taken from real-life events were seen to provide the complexity necessary to encourage critical thinking and logical argumentation at the same time. They were also seen as a means of challenging students to be more active and self-directed learners who rely on themselves and each other for answers rather than on the instructor.

Procedure:

The procedure for translating this approach into classroom reality can be summarized in a four-step sequence of events. The class was divided into groups of four students. Each student in a group worked on a different case, although the set of four cases had some underlying issue in common. The case material was provided by articles from popular news magazines.

The first step required individual students to analyze their cases, following a logical template (see Appendix F) that asked them to identify the main issue, different positions toward the issue, evidence and value assumptions supporting these positions, and a brief statement of

their own position in the case. These individual analyses were sent to the instructor by e-mail and, after the due date, posted in the electronic bulletin board for the entire class to read.

In the second step, the students were asked to read the analyses of their case written by their peers. Given the distribution of the same four cases to each group, each student had available a data base of about 30 one-to-two page analyses of the same case they themselves had worked on. This was designed to provide ample opportunity for confronting their own interpretations with different viewpoints from other classmates.

Students were then to gather in their small groups outside of class to discuss their enriched understanding of their own case and compare it with the cases of their three group members. The purpose was to find the common issue underlying all four cases and to analyze the concerns raised by this issue at different social levels, such as the family, the workplace, and the community. In order to draw the students' attention to the collaborative aspects of their work, they were asked to evaluate their feelings toward the group process at the end of each meeting by filling out a short check sheet.

Step four involved the posting of the groups' discussion results in the electronic bulletin board, along with feedback by the instructor. The whole process was designed to be cycled through four times with different sets of cases, and a fifth case analysis was to be part of the final exam for the course.[2]

Student Background and Group Activities:

The student population in the course is typically 90% female, women in their early twenties, mostly sophomores. Three quarters of them are education majors. The others come from fields such as physical or occupational therapy, speech & hearing, or psychology. Most students do not know each other, and the large class size, combined with the restrictions of an auditorium-style lecture hall, usually prevent them from developing closer relationships during the course of the semester. In a survey taken in this course in the previous semester (see Appendix G), we obtained some background data on students' familiarity with computers and with group work. Only one third indicated a familiarity with word processing. Another third was largely unfamiliar with its use. Fifty percent of the students had never used their University Computing account; the rest, with a few exceptions, had used it only rarely. The situation was even more limited when it came to the use of e-mail or the e-classroom. Two-thirds of the students had never used either one; the others had used them only occasionally. Eighty percent of the class did not own a computer; only one out of the 96 students who filled out the survey owned a modem.

Group work in college proved a more widely distributed experience. Only four students had never been part of a group work situation, and more than 20% had worked in groups on

[2]It turned out that the project ended early after only two such cycles.

many occasions. Sixty percent of all students said they enjoyed group work, and only a small minority disliked it. When people were asked to describe what they did not like about group work, virtually everyone referred to experiences with group members not doing their share of the work.

Our student survey at the end of the experimental course (see Appendix I) supported some of the tendencies observed in the previous semester and added new insights regarding the use of the technology and the students' ability to collaborate in groups. Although the students had been trained how to use e-mail and e-classroom utilities in an initial two-hour workshop, at the end of the course, 60% of them admitted to never having used either medium throughout the semester. Those who did use e-mail used it mostly for private purposes or for communication with the instructor. Communication with fellow students about course-related issues was ranked significantly lower. It must be pointed out, however, that due to the early termination of the course experiment, students had little opportunity to practice their newly acquired computer skills.

Although only 40% were active users of e-mail and the e-classroom, most students indicated their degree of like or dislike for the technology. Two thirds of the class had developed an opinion about e-mail, and the sampling was divided fairly evenly between those who liked and those who disliked it. Seventy percent of the class had developed an opinion about the e-classroom, and three quarters of the respondents indicated their dislike for the medium.

The students were more enthusiastic about the group work. From the 78 feedback sheets collected after two group sessions, only 8 students (in 6 out of 34 groups) questioned the benefits of their group meetings. The others had positive comments about their group experience, saying that they learned from the different viewpoints contributed by other group members, as well as from the magazine articles that provided very current information on social issues they had not considered before to any great extent. The authentic "feel" of current news articles from newspapers or journals seemed to contribute significantly to the positive comments about the group work. When asked in group interviews whether they preferred case descriptions that had been edited to reduce complexity and length, students overwhelmingly endorsed the original news articles.

The skepticism about group work expressed by many students in the questionnaire given the previous semester was partially confirmed by the experiences of many groups this semester. One third of the 34 groups reported difficulties with a member's absenteeism. We visited 13 groups during their second meeting and made the following observations: Group meetings lasted on average 43 minutes, with a range from 17 to 65 minutes. The individual summaries of the 4 articles usually lasted no more than 10 minutes. The students spent 5 minutes discussing the main issue. They then brainstormed about important concerns resulting from this issue for another 10 minutes, writing them down with a reason for why these were important concerns for another 6-10 minutes. The remaining tasks were accomplished in less than 5 minutes each.

In our interviews following the group meetings, we discovered that most students' preparation for the group meeting had been incomplete. More than half of them had not read the other students' case analyses in the e-bulletin board. In looking at their written case analyses, we saw significant flaws in their understanding and the logic of their argumentation. Identifying the evidence provided for a given position in an article seemed a difficult task for some students. Even more difficulties became evident when students were asked to define the basic value and belief assumptions that were underlying positions taken by any of the protagonists or the author of the article.

Problem Analysis:

How can the events in this course be explained? Explanations cover the whole range, from problems with logistics, teaching approach, student expectations, and students' collaboration skills, to the novelty of the technology, and deficiencies in planning and administration of the instructional experiment.

The use of computer conferencing in this class had not been initiated by the instructor. She had originally volunteered as one of the clients in a special technology project of our instructional development office and met weekly with our design team for 1.5 hour discussions. This project had undergone several transformations until it ended up focusing on the use of the Electronic Classroom. Much of the planning for this class was done by members of our office, and many of the shortcomings in this experiment must be attributed to the idiosyncrasies of the larger project.

The logistical problems of the project had been underestimated by us. Training 120 students in the use of the EC was a formidable task. Preparing and distributing handouts and articles to so many students was time-consuming. But the largest problem was created by the arrangement of group work itself. Many groups had difficulties finding a mutually acceptable time for their meetings. The frustrations that resulted from inadequacies in the execution of any of these tasks likely affected the students' readiness to embark on this experiment.

The instructor was an accomplished lecturer, the recipient of several teaching awards, and in many respects a role model for the predominantly female students in the class. She had been teaching this course for over 10 years and had recently co-authored the book that served as its textbook. She had full-time administrative responsibilities, however, which left her little time for complex instructional innovations. All of this created a situation in which her desire to try something vastly different conflicted with the fear of losing control over the energy and time it would take to deal with an instructional experiment going awry. Her way of reducing this risk was by largely separating her class lectures from the activities around the case analyses. As problems surfaced during the first round of case analyses, she relegated the activity to the status of an out-of-class project for extra credit, and left it to the project team to supervise and administer the necessary actions.

As a result, the collaborative efforts around the case analyses and the use of technology

were never integrated into the regular classroom. The students' efforts were guided only by handouts and electronic feedback. Neither we nor the instructor provided a procedural model, the cases were not discussed in class, nor was any feedback given orally to the students. In addition, the instructor did not communicate actively with her students via the electronic medium, because it would have been too time-consuming given her administrative responsibilities and the size of the class. The grading of the case exercises had initially been explained only vaguely to the class. When some of the more competitive students began to voice their fears about being "dragged down" by group grades, what was originally designed as a mandatory component of the course was changed into an exercise for extra credit and, after the second round, was abandoned completely.

Despite a considerable amount of good will on both sides, neither instructor nor students seemed to feel sufficiently comfortable with the notion of collaborative group work in a class of 130 students. Undergraduate students, especially in large classes, have grown accustomed to a role in which they are largely told what is important. During her teaching career, the instructor had developed superb skills in handling such audiences, while at the same time, through her sincere enthusiasm for the course content (i.e., for people with special needs), touching students on more than merely a cognitive level. This approach, however, left little time for her to help students develop their own judgment and the skills required to argue their position in a debate with other people. Although many students seemed to be satisfied with their group meetings, the amount of insight generated by an eight-minute discussion about the general issue underlying four different cases is questionable. Based on our group observations, the majority of students did not exhibit the skill to meaningfully challenge someone else's viewpoint during a discussion, nor to put themselves into someone else's position. These had been the main goals that the case study approach together with the use of the electronic conferencing technology had intended to promote. What could have been done differently?

Possible Improvements:

We clearly needed to provide students with more guidance throughout the exercise. Electronic communication alone was not capable of providing this guidance. Most students had simply not reached the level of independence that is required if one is to rely solely on an unfamiliar electronic medium for direction and support. Without the direct involvement and encouragement of the instructor, any activity is doomed. If the instructor can afford the time and effort for such a classroom innovation, here are the main elements needed to make it work:

1. Appropriate behavior needs to be modeled in class. This includes the modeling of collaborative behavior in groups, such as active listening, being supportive of the ideas of others, encouraging shy group members to take their turn, questioning fast and easy solutions, and verbalizing conflicts that tend to threaten successful teamwork. It also includes modeling regarding the use of the technology, i.e., regular use of e-mail and the EC in order to convince students that learning to communicate through these channels has its benefits.

2. Detailed feedback needs to be given in class pertaining to the students' work in the electronic medium. Students are accustomed to receiving individualized feedback, at least in the form of a grade, when they hand in a written assignment. With classes of a hundred and more, this quickly becomes an impossible task for a single instructor. In our project, we tried to provide well-done case analyses as model feedback for students, posting these in the e-bulletin board. Even with some additional written explanations, this type of feedback was not sufficient. Students needed verbal assurances in the classroom, an opportunity to ask questions and to hear the instructor's deliberations "live." In addition, they needed an opportunity to link the cases they had dealt with outside of class to the material that was covered in class.

3. Clear grading guidelines need to be established underlining the importance of the exercise and describing exactly how the students' work will be evaluated. Projects that are relegated to the status of "extra credit" are not considered enough of a priority for students to spend time familiarizing themselves with a new technology.

Finally, there are some general considerations that determine whether a case study approach using collaboration and computer-mediated communication can be successful in a large class. The physical layout of the classroom should allow student interaction in small groups. The logistics for such a project need to be manageable. Times and places for group work need to be set aside in a lab section of the course for which students sign up at registration. A system needs to be designed that discourages "free-riding" by promptly confronting students who do not do their share of the work. Provisions need to be made for training students in the use of the technology, and for establishing a network of technical peer-assistance throughout the semester. Most importantly, the assignments need to be structured in a way that guarantees thoughtfulness and diversity among the student products that are to be published in the e-bulletin board. Students' individual case analyses in our course were too similar and often too unimaginative to make for stimulating reading. Special incentives could be given for creative viewpoints in individual case analyses, and student groups could compete in designing original plans and suggestions contributing to a (partial) solution of the debated issues.

Research on Model C: Collaborative Test Preparation

One of the insights we gained over the course of the project was that the more central the function of a given technology is within a given course, the higher its chances of being accepted by students and faculty alike, and the more it may contribute to student learning. Examination of student performance is the one element that is taken very seriously in every course. Our third model of computer conferencing focused on the medium's potential to assist with this task. Instead of leaving it up to the individual student to prepare for an exam, likely through the time-honored method of cramming the night before, we sought to have this preparation process stretched out over a longer period and to make it a collaborative effort at the same time. The electronic conference seemed an ideal medium to remove this endeavor from the non-committal

format of private study groups and turn it into a systematic course activity outside of class. Two variations of this approach were attempted with different degrees of success.

Variation 1:

In the first variation, the instructor planned to enter review questions into the Electronic Classroom for students to answer after each class session. These review questions were to emphasize pertinent information and issues from the class lectures that constituted the core material from which a large percentage of the test questions would be derived. The class was divided into small groups which took turns each week in answering the review questions. The review questions were supposed to be designed to contain sufficient latitude and controversy so that there was room for debate. The opportunity for debate was systematically built into the electronic conference in that a second group of students was required to discuss the first group's input. All this was designed to help students learn the course material in a more active and continuous fashion, while at the same time providing important feedback to the instructor about the depth of his students' understanding. Since this course was taught via two-way television simultaneously on two campuses of Indiana University, the use of this approach had also another function. It was hoped that the medium would contribute to interaction between students on the two campuses by involving teams from each campus in the answer-rebuttal process following each review question.

The contingencies of teaching this course via two-way television might have been responsible for the fact that the model was never systematically implemented. Not enough training was available for either of the class sections, and even electronic mail across the two campuses caused occasional problems for students. VAX-Notes could not be accessed with student ID's from Indianapolis, so special arrangements had to be made for them. Probably the biggest hurdle was the fact that the Indianapolis campus is predominantly a commuter campus. Many students drive to school only two days a week and cannot spend the extra time for special group assignments in computer clusters. Since few students own a computer with modem, difficulties in accessing the technology caused considerable resistance.

Variation 2:

The second variation of this model is more complex. It was used in a course described earlier (see Model A, Variation 2). The instructor wanted to experiment with a different approach to testing that could assess students' critical thinking abilities without requiring the instructor to read long essay exams. The approach had been developed by a professor of Anthropology at IU (Martha Kendall) who teaches very large introductory classes. In her classes, the students are given a multiple choice test that also includes brief justifications of select questions. But instead of presenting them with tasks of factual knowledge, requiring only memorization, the test items force students to synthesize their readings and lecture notes in ways that demand critical thinking and reflection. Such deliberation, of course, cannot be done within a one or two-hour exam. The test items, or most of them, are therefore given to students a week ahead of time to allow careful preparation. Students are also encouraged to prepare in

groups, since many of the items cannot easily be reasoned out by a single student. Thus the preparation becomes the real test, and students learn to think rather than reproduce static knowledge.

This approach to collaborative test preparation was adapted to incorporate the Electronic Classroom. The class was divided into small study groups and clusters, consisting of three or four groups each. The study groups (usually 4 students per group) were created before the first test, for which the Electronic Classroom was not yet made available. Beginning with test 2, study groups were combined into clusters. Each student in a cluster was given the same ID number, which allowed group members to log on to the system under the same name. The idea was for the students in the clusters to be able to post answers to share amongst themselves while keeping them away from the other clusters. This was done by using the "hide note" command, which limits access to those who have the correct ID number. (The same could have been achieved by creating a separate conference for each cluster of students with protected conference access.)

We intended to create some competition among the clusters that would reduce "free-riding" and motivate each member of a cluster to do his or her best, even help each other. To encourage the competition, extra credit was given for above-average performance by individuals and individual clusters.

The whole procedure for test preparation using the EC involved the following steps:

1. About one week before the test, the instructor inserted 20 test questions into the EC (mostly multiple choice), creating a separate topic for each one.

2. Each student in a cluster was assigned to answer and discuss 10 of the 20 questions. Each question was addressed by about 5 different cluster members. This allowed students who entered their answers later to discuss the answers of their peers.

3. Students could see only the answers of their cluster members since every cluster was hiding its input from others with its special cluster ID.

4. It was left up to the study groups to meet face-to-face shortly before the test and make final decisions about the best answers to each question. Most study groups did arrange such meetings.

5. During the test, students answered the previewed questions as individuals and from memory. The instructor usually selected 10 of the questions and requested brief (one- or two-line) justifications for the multiple choice answer. The instructor also included additional questions that had not been previewed, again to avoid a situation in which some students relied too heavily on the efforts of their peers.

6. To assign the credit for the students' individual preparation and that of their cluster, the

instructor selected a small number of EC-notes from each student and cluster for grading. Individuals received credit according to the sophistication of their answers, and clusters were evaluated based on the quality of the team's discussion of a given question.

In the following we present analyses of the activities of the students within the Electronic Conference and the collaborative learning they spawned.

Development of students' EC activities over three tests:

The preview questions for each of the last two tests and the final given in the course varied somewhat in character. Although each preview had a blend of short answer, true/false and discussion questions, the percentages of each changed subtly from one test to another. These changes tended to influence overall student performance on each test.

As shown in Table 1, the preview questions for test 2 and the final exam included fewer discussion starters than did test 3. The preview for test 3 not only provided 3 (versus 2 or 0) discussion questions, but also more opportunity for discussion taking place around true/false questions. Overall, the preview for test 3 provoked longer responses to each of the questions. It also functioned as a catalyst for greater intra-group discussion.

TABLE 1:

Type of Questions:	Test 2	Test 3	Final
True/false	9	11	8
Short answer/Multiple choice	11	6	10
Discussion	0	3	2
Discussion starters	7	14	11
Replies to replies	0	63	53

As a result of the differences in the test preview formats and other factors--including time of the semester, familiarity with the computer software, classroom instructions, etc.--the number of specific replies to other students' answers was greatest for the preview of test 3. These data are shown in Table 1, which also indicates that there were no specific replies to other students' answers in the preview for test 2. This may be explained by two factors: first, the initial reluctance of some students to use the computer and second, ambiguous instructions given by the professor of the course. The number of replies to students' answers tapered off on the final preview. This is most likely explained by the time constraints placed on students near the end of a semester. In addition, computer access near the end of the semester may have been somewhat limited in comparison to other peak times during the semester.

Table 2 also shows that the sheer number of replies to the preview questions increased steadily with each test. The initial apprehension felt by many regarding the use of the electronic classroom easily explains the sparseness of replies for the first preview. Although the final preview had the largest number of replies, they exceeded those for the preview for test 3 by less than 50. This is somewhat surprising, considering the fact that students had access to the preview questions within the electronic classroom for twice as long as for either of the first two tests.

TABLE 2:

Test 2
answer input

Feb. 14	16
Feb. 15	1
Feb. 16	26
Feb. 17	14
Feb. 18	166
Feb. 19	220
Feb. 20	82
total replies:	525

Test 3
answer input

March 20	8
March 21	5
March 22	21
March 23	32
March 24	121
March 25	169
March 26	210
March 27	101
total replies:	667

Final
answer input

April 17	0
April 18	0
April 19	0
April 20	0
April 21	0
April 22	3
April 23	1
April 24	7
April 25	9
April 26	30
April 27	40
April 28	79
April 29	202
April 30	225
May 1	101
total replies:	716

Table 2 shows the progression of quantity of responses by day for each of the three tests where preview material was supplied. Note that in all three cases, the number of responses did not reach 85% of their total before the day prior to the test. In the instance of the final, it was not until the very day of the exam that 85% of maximum was reached. This was in spite of the fact that half of the preview questions for the final exam were given two weeks prior to the day of the exam, whereas only a week was given for each of the other two test previews. None of the students took advantage of the first five days of extra time for the final preview.

Limited access to computers as well as a lack of genuine interest in other students' responses may, in many cases, provide an explanation for the large numbers of responses entered just before a test or exam. Also a factor might be the limited amount of time students were willing or able to spend on this one class. It was obvious to an observer in the classroom that the necessary preparatory reading was often not finished until shortly before a test.

A correlation coefficient was calculated for the relationship between the quality of response in the electronic classroom for the semester (as judged by the professor in the course) and overall performance in the class. The Pearson r was found to be .694, showing a positive correlation between overall quality of performance in the electronic classroom and the performance in the class for the semester. Although a correlation does not show direct causation, we do believe that the quality of response on preview questions in the electronic classroom may have influenced overall course performance.

Students' group meetings during the semester:

At least 10 out of 15 study groups which met before the first test continued to meet before the other tests throughout the semester. The face-to-face meetings seemed to become an integral part of the informal class structure. In fact, of the 40 students surveyed (see Appendix H) and 12 interviewed, only 3 had never met in a group before a test. In at least one of those instances, the student did meet occasionally with one other member of the group.

Study groups tended to meet with the same regularity throughout the semester, typically once before each test. At least nine of the study groups also met more than once before a particular test. The tests requiring more than one meeting varied by group, based on the perceived group need for extra study time or time conflicts for the entirety of the group. Over half of the study groups interviewed intended to meet twice before the final exam.

On the average, study groups met for approximately 70 minutes before each test. The meetings were generally held two days or the day before the test. The time was spent mainly discussing preview test questions with the typical pattern as follows:

1. With questions in hand, the students attempted to come to a consensus on each of the twenty preview questions.

2. Any questions which were not resolved immediately were researched in the appropriate material from the readings or class lecture notes.

3. If a resolution was still not possible (which rarely happened), then each student would keep his answer and go to the electronic classroom for further enlightenment.

With one exception, students in the 7 groups we interviewed had already placed their answers to the preview questions in the electronic classroom before the group met. Most students entered their own responses before reading those of their peers. The student would

then look at the responses to questions which were difficult or about which the student felt uncertain. The first responses to which the student would refer would be those placed in the EC by the other students in the study group. Only after these were examined would the student move toward reading the responses of the cluster members.

In this way, prior to their face-to-face meetings the students already had a good idea about how the other members of the groups had answered their questions. Therefore, discussion of many of the preview questions would take only a very short time in the group meeting. The questions which had ambiguous or multiple answers would generally occupy most of the study group meeting.

Social interaction within the classroom setting was enhanced greatly for those groups who met regularly. The students felt more comfortable with their peers in the class, and these groups were readily available for use by the instructor for in-class group work. On a less positive note, many of the students associated exclusively with the other members of their group. The pre-existing group structures thus proved both helpful and limiting. In other classes with group work, the students would likely have met more people within the class through contact in more spontaneously constructed groups. On the other hand, forming new groups for each class meeting would be more cumbersome for the instructor and maybe not as productive for the students who would have to reorient themselves frequently.

While the study groups, which were formed before the first test, flourished for the entire semester, the cluster formations were exclusive to the Electronic Classroom and were not particularly useful except as a technical grouping mechanism. Students did not seem to have any greater relationship with their fellow cluster members than they did with those outside the cluster. The study groups seemed to form strong bonds, while the clusters tended to be loose associations that existed solely within the electronic classroom. Even though they knew that bonus points were based on their cluster performance, students seemingly felt incapable of affecting the overall conduct of the cluster.

Relationship of class discussions versus group and EC discussions:

Without a doubt, study group discussions and exchanges in the Electronic Classroom were the most successful aspects of this class. The discussions held face-to-face in class were much less effective. They were centered around 4-6 people who were willing to participate in the large class setting and had kept up with their out-of-class reading assignments. These people quickly became known to the class and provided most of the thoughtful comments during class time.

The Electronic Classroom, by contrast, not only allowed all the students to participate in a large group discussion; its required usage forced all students in the class to participate and thus placed all the members of the group on the same level of information when it came time to meet. In this way, the Electronic Classroom facilitated study group meetings. Being required to respond in the EC forced the members of the study group to think about the test prior to the

meeting, and to do some advance preparation.

The use of the EC and study group work was complementary in this instructional model. Without the discussion of preview questions in the electronic medium, the study group meetings might have been unwieldy. Group members likely would not have considered themselves to be equals, but would have deferred to those demonstrating more thorough preparation and mastery of the material.

At the same time, the electronic classroom would not have been nearly as cohesive without the groups. Face-to-face contact seemed crucial to the mitigation of anxieties, especially before the test. The group meetings also provided an opportunity for students to pass along information about the class, provide notes for those who may have missed class and to share multiple perspectives on key issues in the class.

Unfortunately, some of the positive aspects of the interaction in the EC and the study group meetings might also have detracted from the class meetings themselves. Students did not always find it necessary to come to class since they had a reliable method for getting the class notes from someone else. At least one member in every group we interviewed expressed this as an added "convenience" of the EC. This was reflected in low attendance figures. In this respect, added flexibility for the individual probably contributed to decreased responsibility to class and instructor.

CONCLUSIONS:

A. Concerning the adoption and diffusion activities:

1. Overall faculty reactions to VAX-Notes at IU

In April 1991 a questionnaire titled "Survey on Electronic Classrooms" (see Appendix D) was mailed to 54 faculty members who, during the current or recent semester, had opened an Electronic Classroom for their course. Twenty-two persons completed and returned the survey. A follow-up telephone campaign yielded 15 more responses; 5 of these respondents, however, indicated that they had not used the Electronic Classroom. The figures cited below are based on the data collected from 32 professors on the IU-Bloomington campus.

Several questions within the survey addressed faculty involvement in the Electronic Classroom, both in terms of participation in various activities intended to expose users to its potential, and time dedicated to preparing for the medium. To learn about potential applications of the Electronic Classroom, the respondents most often took advantage of campus workshops, with 15 of 25 participating. Thirteen faculty members turned to each other as resources, and 13 respondents cited the ECAL VAX-Notes conference (created by our project to exchange

experiences about EC's) as a source of information about the EC.

For the most part, the faculty members were not willing to devote a large amount of time to preparing for the EC. Seventeen of 26 spent less than two hours weekly, while 6 dedicated two or three hours per week. Only 3 faculty members devoted more than three hours weekly to their preparation for the EC. A survey question measuring the willingness of the faculty members to spend time developing and conducting a class incorporating a "new and improved" EC yielded similar results, with 13 respondents willing to spend 1-2 hours and 5 willing to spend as much as 3-5 hours per week. On the other hand, only 3 respondents were unwilling to spend any extra time whatsoever, which would seem to reflect a generally positive response to the EC.

A number of questions were asked of the professors in order to establish a profile of the different courses in which the Electronic Classroom was used. The EC was used in conjunction with a variety of teaching approaches, but most of the professors surveyed indicated that their teaching methodology consisted of lecturing or some lecturing. Another significant sample of the respondents indicated that they used a discussion format in their class meetings.

Most of the respondents used the Electronic Classroom for a variety of tasks. These tasks include posting class announcements; posting grades; publishing class materials, such as outlines or handouts; answering questions posed electronically by students; and posting topics for student discussions. Thus the use of the EC included but was not limited to administrative tasks. In fact, while 25 of 28 respondents posted class announcements on the EC, 16 of them indicated that this function of the EC comprised 25% or less of their total use of the system. Eight professors posted grades on the EC, and 20 published class materials for the students to download if they desired. Nineteen of the respondents used the EC to answer questions from students, but this comprised less than half of their total use. Seventeen professors posted topics for student discussion on the EC, and 2 allowed students to initiate discussion topics of their own. Since this is the function of the EC most closely connected with collaborative learning and therefore most relevant to this study, it was encouraging to find that so many of the respondents at least experimented with this application.

The number of topics created in the EC by the instructors varied between 1 and 93, with a bimodal distribution peeking slightly above 10 and slightly above 20. In most cases, the students were required to respond to the topics, and their responses were evaluated and factored into the calculation of their grade for the class. Only 3 respondents reported minimal (0-20%) participation among the students.

When asked to evaluate the Electronic Classroom, respondents indicated that the convenience of being able to post messages for students in between class meetings (18 respondents), and the increased flow of information (23 respondents), whether administrative or academic, were one of the two most beneficial features of the technology. Only 8 respondents chose as one of its most positive features the ability of the EC to make students more thoughtful and active learners.

A significant number of respondents also addressed the role of the EC in improving the intellectual and academic achievements of the students. Eleven of 19 professors felt that there was a positive relationship between the EC and the students' ability to discuss course materials in class. Ten respondents noted an increase in social interaction among the students as a result of the EC, which manifested itself in various ways, including an increase in overall class cohesion and a reduced level of inhibition among the students within the traditional classroom setting.

The technical and functional restraints of the VAX-Notes software along with the slow response time of the University's computer system were cited by many respondents (18 of 32, 16 of 32) as their greatest disappointments with the Electronic Classroom. Others named as significant frustrations difficulties in training the students to use the technology and the students' reluctance to participate if participation was not required. A separate observation made by 5 of 8 respondents voiced the concern that students did not gain a substantial amount from the use of the EC. Indeed, 9 of 19 professors failed to note any significant increase in the quality or quantity of ideas expressed in the EC as compared with ideas in the traditional classroom setting, and 2 noted that students' electronic comments even were below class standards.

Several questions in the survey asked the faculty members to consider future applications of the Electronic Classroom: whether they would continue to incorporate the technology in their classes; whether they intended to modify their use of the EC; the types of changes in the medium that would be required in order to increase its effectiveness as a teaching tool; and finally, assuming that those changes could be made, the types of applications they were able to envision. Twenty-six of 29 respondents indicated that they would use the EC again, if not for the same class, then for another. Twelve of 23 faculty members planned to continue to use the EC in the same way, but 6 hoped to put more emphasis on the medium in the future.

Sixteen of 31 respondents specified as one of their first two priorities that in order for the Electronic Classroom to significantly impact the teaching-learning process, the software would need to be improved to allow for easy editing and multiple levels of response. Better access to computer facilities for students (and faculty) was listed as one of the two primary concerns of 16 faculty members. Many respondents felt that student training for the use of the EC needs to be addressed systematically, rather than leaving it to the professor's discretion, and many voiced support for the idea of a series of models to introduce the faculty to effective uses of the utility in classroom teaching. The faculty demonstrated an openness to the potential of the EC as a teaching aid; none of the respondents saw the applications of the EC as limited to administrative tasks.

The respondents were asked whether they could envision the Electronic Classroom functioning to allow students to take the initiative in discussing aspects of course content. Twenty-two of 27 agreed that the EC held the potential for this type of application. Twenty of 28 thought that the EC could provide a means of allowing students to work collaboratively on group projects. Most respondents doubted that the EC would be effective as a tool in shifting

responsibility for coverage of course materials to the students, however. This may, of course, also be a measure of the faculty's reluctance to give up that responsibility, traditionally central to the professor's job description and identity.

Overall, this survey demonstrated a significant increase in instructors using the medium for more than merely administrative purposes over the past two years. In the fall of 1989, we had conducted a phone survey of 18 of the 28 instructors then using the EC. At that time, there was a tendency among instructors to use the medium for posting announcements, course materials, grades, and to answer questions from the students concerning administrative issues and course content. Only 5 of the respondents indicated that they were also using the medium to increase interaction among students. Only one instructor had made the kind of effort in designing a special application for his class that we saw in the courses we observed over the past two semesters.

2. Reactions of different student populations to the use of electronic medium for collaboration:

The students in classes using the EC were also surveyed as to their reactions to the new technology in instruction. Since these surveys were conducted at different times over the last year and not all of them for the purpose of our project, the questions and resulting data are not altogether compatible. In the following discussion, data from 8 courses and a total of 468 students are combined to provide some overall impressions of student background and opinion (see Appendix I). Along with the four courses described in the three models above, the sample included a graduate class in education, two graduate classes in library science, and an advanced undergraduate class in recreation and park administration.

A good portion of the available information relates to the use of electronic mail. E-mail may be considered the entry level for electronic communication networks. For many students, mastering the mechanics of e-mail is the first step in learning to communicate with others via computer. Recognizing that e-mail has a unique potential for communicating with others seems to be a first condition for opening users up to the more complex concepts of computer conferencing. It is significant in that context that in the 4 classes where we asked this question, only 26-47 percent of the students had used e-mail for school purposes prior to that course (2 of the 4 classes were graduate courses!).

Given the relatively low degree of prior experience, most students seemed to get used to e-mail rather quickly. Where the instructor actively encouraged its use, many students logged on to the system more than twice a week (40% in class A; 60% in class B; 90% in class C). Students overwhelmingly came to like the medium (70%, 83%, 98%). The tendency is apparent: the more they used e-mail, the more they liked it. The one class that did not promote its frequent use also supports this correlation: the students in that class were almost evenly split among those who liked, disliked, or were neutral towards the medium. The two main uses of e-mail cited by the students were communication with the instructor and for private purposes.

It is not surprising that, compared to e-mail, the overall approval rating for the EC was significantly lower. Four out of five classes had approval ratings of 40 to 66 percent. In the fifth class, which used it only marginally, only 18 percent of the students liked the medium and 53 percent disliked it. For sporadic usage, the medium was clearly too complicated for students to appreciate its potential. But even within the two classes that probably used the Electronic Classroom most of all, not every student was enthusiastic about it. When asked whether they would take another course using the EC, only 29 percent of the students in each of these two classes answered positively. Fifty-one and 62 percent said "maybe," and 20 and 9 percent responded negatively.

In 3 out of 7 classes, what students clearly liked most about the EC was the opportunity and ease of receiving supplemental information from their instructor. Students in three other classes focused more on how the EC improved their abilities to express themselves or learn from each other. In the remaining class, students seemed to appreciate both advantages equally.

Between 31 and 77 percent of the students in five classes surveyed complained about problems with access to networked computers. Most students do not own a computer. In the case of one undergraduate course, only one out of 96 students owned a modem. Few computers are available in dorms. Logging on to the system for most students means at the very least having to make an extra trip to one of the approximately 35 public computer clusters on campus. Often it also means waiting for a computer to become available in the cluster. Consequently, what students liked least about the EC was the time and inconvenience involved in doing their assignments away from home, especially if these assignments seemed to be of low priority in the course.

The second aspect that students disliked about the EC was having to deal with a software application whose functions are not very intuitive and rather clumsy compared to the more familiar microcomputer applications. Students were reluctant to learn the commands for a software they could not use on a PC, one that seemed to have no utility beyond the boundaries of that particular course. This is reflected in the fact that even in the two most EC-intensive courses on campus, students were unfamiliar with some of the more useful commands of the software. Only a few students, for instance, ever extracted, up- or downloaded, or printed a file. This means that most of their interaction with the numerous notes in the EC was done directly on the computer screen, thus preventing more in-depth involvement with the material that would only have been possible through printouts.

In combining pertinent information from the faculty and the student surveys, our two main conclusions revolve around the improvement of access to computer terminals and of the conceptual application of the medium. Computer conferencing will only show its full potential when networked computers are easily available to every student in class. Only if it is as readily available as the telephone will students utilize it to truly communicate and collaborate rather than merely to type in their assignments. As long as they need to make extra trips to the computer clusters, it is less likely that students will follow the cycle of reading-reflecting-responding. Being pressed for time, the first two steps will be cut short to avoid having to

make a second trip to the clusters. Other improvements need to be made with the software itself, which currently lacks intuitiveness and flexibility, and does not invite users to explore its capabilities.

The faculty seems to have become already more willing to experiment with some of the student-focused aspects of the technology. The pioneer work of some individuals should have an impact on other faculty, as long as a mechanism for sharing concepts and experiences is in place. More emphasis needs to be put on the functions of the medium for active learning if it is to be taken seriously by students. As long as the current hurdle of limited access to computers exists, students will not bother with a casual use of the medium. Too much time and effort is required to simply become comfortable with the technology and accept the inconvenience of its access for it to be used only for minor tasks. Only a more systematic integration into the course curriculum that puts significant weight onto its use will help the medium develop its potential to create a learning environment conducive to collaboration and inquiry.

B. The Conceptual and Practical Use of the Technology

1. General Conclusions:

Although the Electronic Classroom has not been used to its full potential in any of the courses described, these case studies have shown that thoughtful use of the medium can improve student involvement in the learning process, even in very large and distance education classes. Computer conferencing can help reduce the feeling of anonymity that many students have in high-enrollment courses. It can even contribute to a sense of community in such courses if students recognize that their conference notes are read by instructor and classmates, and that, accordingly, they can have an impact on elements of the course content and its format.

In courses incorporating the Electronic Classroom, a larger number and greater variety of students have the opportunity to participate in class discussions. Those who are not comfortable speaking in front of a large audience, and those who simply express themselves better in writing, have an opportunity to share their thoughts with the class in a less pressured situation. Students can carefully compose their ideas before submitting them to the scrutiny of their peers. They have time to reflect on what was said in class, and when they respond, they can incorporate relevant personal experiences into their comments. The development of professional judgment skills that are based on people's value and belief systems can be dealt with much more extensively in this medium than would usually be possible in a large class. Instructors can widen their horizons regarding their students' patterns of interest and understanding. They gain a new means of studying the teaching-learning process, and their students' written discussions provide a convenient database of information that allows instructors to customize their teaching.

All this can only work, however, if some important pedagogical mechanisms are put in

place. The instructor needs to indicate her or his support for the technology by structuring the course so that activities incorporating the medium are weighted equally with other, more traditional classroom activities. In some of the cases discussed here, too little emphasis was placed on the medium. Many students will not bother to learn the mechanics of a new technology, much less explore its potential for more meaningful learning, only for the sake of some extra credit or a participation grade that comprises only 5% of the final grade for the course. The necessary investment seems disproportionate for the return.

The second important element is careful modeling of what is expected from students in this new medium. In some cases, this modeling has to be done by the instructor. He or she may provide a detailed description, for instance, of what a self-introduction should look like, what distinguishes an individual's entry in a discussion from a monologue, or which steps are essential to a case analysis. At other times, modeling is more effective when it is done by peers. The instructor can facilitate this by delegating responsibility for moderating certain parts of the electronic conference to small groups of students.

Another consideration concerns the role of the instructor in the Electronic Classroom. Students often pay more attention to what their instructors do or don't do than to what they say. For students to take ownership in the new technology, thereby making it a medium for student collaboration, it is important for instructors to restrain themselves from excessive intervention once the basic structure is in place. The instructor's main work for the EC, consisting mainly of careful planning of a sequence of activities and procedures for the EC, should probably happen before the semester begins. After the semester has started, much of the initiating and monitoring work is better performed by designated groups of students. However, the instructor needs to be aware of what is happening at any time and respond promptly if his or her expertise or authority is required. Otherwise, it can be more beneficial to student collaboration if the instructor takes on a coaching role and provides feedback to individual students' contributions by private e-mail.

2. Advantages and Disadvantages of Model A:

Periodic insertion by the instructor of topics for ongoing discussion opens up a variety of opportunities unique to this usage of the Electronic Classroom.

* Students can become more actively involved with the course materials. A regular topic that deals with the weekly readings, for instance, might be a useful mechanism for encouraging students to keep up with the assignments, while at the same time providing an immediate opportunity to test the meaningfulness of the new knowledge.

* This model can help students reflect upon their own learning behavior. This may be accomplished by inserting a topic that asks students to discuss their experiences with this new medium, with collaboration, or other alternative learning formats. Or it may be the subtle outcome of a situation where students are forced to deal with a new way of learning. Both mechanisms support the acquisition of metacognitive knowledge about one's own

learning behavior, which is considered an important catalyst for individual intellectual development (Brown, 1987; Flavell, 1979; Peterson, 1988).

* Students can take more ownership in a course when they are given the opportunity to create their own discussion topics, to moderate the discussion of their peers, or to suggest changes in the way the course is taught. Increased student ownership is likely to result in increased student involvement and learning.

* Students in large classes can enhance their social life by identifying through their computer contacts fellow students with corresponding interests. Similarly, students may seek and find assistance from other classmates by posting public announcements in the electronic bulletin board.

* Students may enjoy a class, even a large one, considerably more if they have the opportunity to use part of its electronic meeting facilities to establish a little "subculture" of their own, i.e., to tell their kind of stories, voice their hopes and their frustrations, etc. Such an outlet also has the potential to help a predominantly TV-oriented culture express itself verbally again.

* Instructors are given the opportunity to look into their students' "souls" rather than only their brains. This can be educational, especially for professors who have lost contact with their students because the size of their classes has eliminated any hope for meaningful encounters.

* A diverse EC, such as the one presented in the second variation of Model A, allows students to provide the instructor with a multitude of feedback that ranges from humorous remarks in the Coffee House to substantive criticism in the Opinion Page and proposals for improving classroom teaching in the Suggestion Box. No traditional assessment procedure allows students such latitude in the feedback to their teacher, or enables the instructor to do such a thorough analysis of what worked and what didn't in his or her class. (This ability of the medium to document the teaching-learning process of a class might even provide a solution for the long-standing problem of finding an appropriate method to review an instructor's teaching abilities, e.g., before awarding tenure.)

Disadvantages of Model A, on the other hand, include the following risks:

* If the function of the technology and the quality of its use is not carefully integrated into the overall course activities, tasks in the EC will quickly take on the character of busy work. The medium will subsequently be rejected by the students and the instructor may lose credibility because students feel their time has been wasted.

* Unless clear conditions are provided for an ongoing assessment of discussions in the electronic conference (at least for those topics that deal with course content), students may insert isolated statements that fail to create interaction and discussion among the different

entries. Most school activities are still driven by competition for grades. Any attempt to increase collaboration will have to make judicious compromises within this reality.

* In large classes with high student response rates, individual topics can receive considerable input within a short amount of time. The sheer quantity of input can lead to information overload, discouraging students who log in once or twice a week from following the arguments of their peers. Close monitoring can prevent such situations if the conference moderator recognizes topic saturation and regroups new arguments into separate topics.

* Inadvertent or intentional abuses within the Electronic Classroom have been rare thus far. Especially in the relative anonymity of very large classes (often of multicultural composition), however, individual students may enter comments that are offensive to others. This is another reason why frequent and thorough monitoring of the conference is important, so that quick action can be taken before further damage is done.

3. Advantages and Disadvantages of Model B:

The use of the Electronic Classroom for case studies or similar project formats involving proceduralized argumentation templates and out-of-class group work, is, at this point, the most unexplored model. It is also the most involved. Its main advantages are:

* Students get more actively involved in the practical and ethical dimensions of a field of study. Cases, especially when presented in the form of an authentic news report, function as an important counterbalance to the limitations of textbook knowledge. Pedagogically valuable cases have no clear right or wrong answers, and thus challenge students to develop their reflective judgment beyond the rules of textbook prescriptions. At the same time, instructors are able to extend their impact upon students beyond a merely cognitive level, to one where they impact the students as complete human beings.

* Students' cognitive skills are also developed by this approach. Large segments of the undergraduate population need considerable work in developing the ability to analyze arguments logically. Students need guided practice in identifying issues, finding supporting evidence, analyzing the assumptions underlying a given position, and drawing conclusions for their own positions and the actions required. Large classes can hardly provide such practice unless the electronic medium structures/standardizes the task and makes it possible for students to compare their work and receive feedback on its quality.

* Students can learn valuable group skills if they are meeting face-to-face to discuss their individual conclusions and have to work out an agreement that appears fair, based on compromise. Improving their social skills in small groups goes hand in hand with better and more enjoyable social relations in class, which foster student motivation and involvement in the subject matter.

Disadvantages result from both the logistical and pedagogical complexity of this approach.

* If Model A requires the instructor to make it worth at least 15% of the course work, Model B requires twice as much. The effort required of the instructor in preparing the activities and of students in handling the system makes the approach inappropriate for only an occasional exercise. Unless work on case studies becomes a focal point in the course, Model B is too time-consuming relative to its benefits.

* No handout and no structured procedure alone can communicate sufficiently to students how to use a logical argumentation template or how to collaborate effectively in small groups. These key skills need to be modeled repeatedly in class. If a significant amount of class time is not reserved for this, students' work in groups and in the EC will be unsatisfactory.

* Group work outside of class is prone to conflict. Some students tend to avoid doing their share of the work, resulting in complaints from team members whose grade depends on the efforts of the whole team. Unless clear provisions are made to resolve such conflicts, the group work may be a frustrating experience for many students.

* Individualized feedback is another problem. The instructor cannot provide individualized comments to each one of a hundred or more case analyses six times during the semester. Alternative feedback modes need to be developed to help students improve their skills. Such alternative modes may include forms of paradigmatic feedback in the EC, peer feedback, individualized feedback to different segments of the course each time, and oral discussion and feedback in class. No matter what the format, students need to understand the criteria for a good case analysis and for the grading of individuals and groups.

4. Advantages and Disadvantages of Model C:

The Electronic Classroom as a tool for collaborative test preparation has great potential as a serious alternative to traditional practices of testing based on memorization.

* Model C shows a way out of the accepted truism that large classes of undergraduate students can only be assessed on factual knowledge acquisition. Since what is tested usually defines what students are willing to study, the result has been memorization and low-order concept learning. Providing students with a mechanism to debate real problems that cover the most relevant areas of a test while preparing for it communicates that a different order of learning is required in such a course.

* Making the preparation for a test an integral part of the course agenda, a part that is itself subject to evaluation, is likely to result in deeper understanding and longer retention. Instead of "cramming" for a test the night before, students are forced to go over the material a week or more ahead of time. When students choose to add study-group meetings to the discussion in the EC, they are better prepared for the face-to-face meetings, and thus much of the conflict that can result from unmotivated group members trying to take advantage of their peers' advance preparation is avoided.

* Collaborative test preparation helps students look upon each other as sources of information and expertise. Solving problems creates self confidence. Learning to solve problems in a group of peers, instead of relying on the instructor, makes students less dependent upon authority figures. It also teaches them the value of looking at problems from multiple perspectives.

* Instructors gain important insights into the learning patterns of their students. Their rationales for solving a problem are documented step by step in the electronic medium. This provides a means of analyzing students' typical misconceptions and systematically addressing them in subsequent class sessions.

Of course, this approach is not without problems, either. Although it is not as demanding of the instructor as Model B, it does require considerably more preparation and structuring than Model A.

* The basic requirement for Model C is that a class has a minimum of three to four tests per semester. A midterm and a final exam alone will hardly allow students to familiarize themselves sufficiently with the various procedures to appreciate their usefulness.

* The instructor needs to generate a pool of appropriate test questions that are sufficiently challenging to generate engaging discussions over the most appropriate answers. Students can help formulate such questions, but experience has shown that it takes considerable creativity and fine-tuning over time to create good thinking questions.

* Depending on which variation of this model is chosen, the setup of the EC can be very elaborate. If clusters of students compete with each other, separate spaces need to be created for each cluster, requiring either the provision of special cluster ID's or of separate EC's for individual clusters.

* Student groups can only compete with each other if high and lower performers are evenly distributed. If group members are self-selected and too homogeneous, fair competition is unlikely. Some groups will score consistently poorly and thus reduce their motivation for improvement.

* Since not only tests but also test preparation itself has to be assessed in this model, the instructor must deal with an extra grading task.

* Students may perceive the test preparation in the electronic medium as a shortcut through the course. Instead of coming to class regularly or doing the readings on a weekly basis, they may try to crunch their active learning for the course into the electronic discussions. This results in deserted classes and students who are not prepared to discuss course materials in class.

* The latter problem, especially, may make it almost unavoidable to combine Model C with

Model A, forcing students to keep up with the course materials by requiring regular discussions of class readings in the EC. Such regular activities in the EC are also desirable simply to help students maintain their familiarity with the technology.

5. Recommendations:

In the final analysis, all three models can be recommended for use in large as well as distance education classes. However, there are vast differences in what each of them requires from students and instructor, and differences in what they might help accomplish in a course.

Model A is the most generic and can be adapted to almost any class without much risk of negatively influencing other class activities. Probably the best mix for most courses would be a combination of generic topics (a) for socializing ("Coffee House") and (b) for open discussion of anything relating to the course ("Opinion Page," "Suggestion Box"), and of weekly or biweekly topical issues ("Class Readings," "Class Topic of the Week"). Enlisting student help in moderating especially the latter category of topics can be extremely beneficial.

Model C can become much too involved to be used by a novice to the system. Planning the logistics for groups or clusters of students in electronically protected EC-spaces, developing test questions capable of generating discussion, and creating a workable system for selectively reading and evaluating student input are tasks that require some experience with the management of collaborative learning approaches and with the technology itself.

This model is much more feasible in the version where groups of students take turns debating weekly review questions in an open conference. This approach considerably reduces the workload for students and instructor. Our experiences thus far, however, do not yet provide a clear indication that the approach has the potential to significantly contribute to student learning. Much depends here on the instructor's ability to make the weekly review questions highly pertinent to the items on his or her tests, and also to make them sufficiently open-ended and controversial so that genuine debates will result. Either variation of Model C will probably have to be complemented by at least a basic version of Model A. Otherwise students will not become familiar with the technology, and they will be forced to relearn the procedures each time they have to log on.

Model B is very different from the other two, in that it subordinates the technology completely to face-to-face collaboration. As such, it could not be used in a distance education environment, and even in on-campus classes organizational problems may be considerable. It is possible to avoid many of these problems, however, by transferring the group collaboration into the electronic conferencing medium. As in the variations of Model C, student groups could debate cases in the Electronic Classroom. The argumentation template would provide a structure for the conference topics. Student groups would either compete with each other for the most insightful case interpretations, or take turns in debating different cases across the semester. Such procedures would eliminate the logistical problems of arranging face-to-face

group meetings, as well as many of the pedagogical problems arising in live groups that lack guidance and experience in cultivating meaningful discussions.

We have thus described a range of applications of computer conferencing that allow large classes and distance education classes to engage in highly interactive and challenging activities across the three major levels of classroom learning: (1) ongoing classroom discussion (Model A); (2) class projects (Model B); and (3) assessment of student learning (Model C). It is only natural that each of these functions requires a different involvement of students and instructor alike. It is also natural that designing EC activities for Model B or C is more likely to succeed after the instructor has had experiences with Model A. All three applications are viable options for creating active and collaborative learning conditions. Computer conferencing will not solve the problem of overcrowded classrooms, but it may help prepare instructors and students for better times in which collaborative learning and attention to individual students becomes standard practice in our college classrooms.

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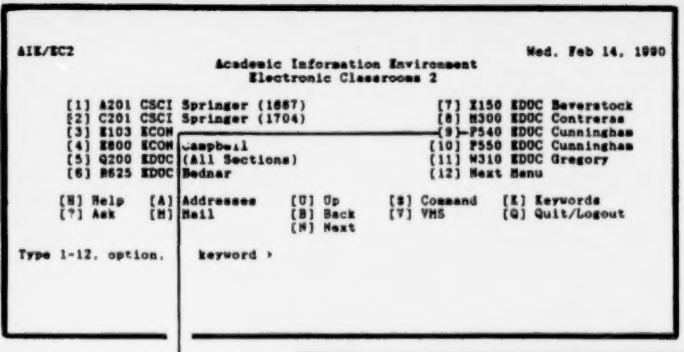
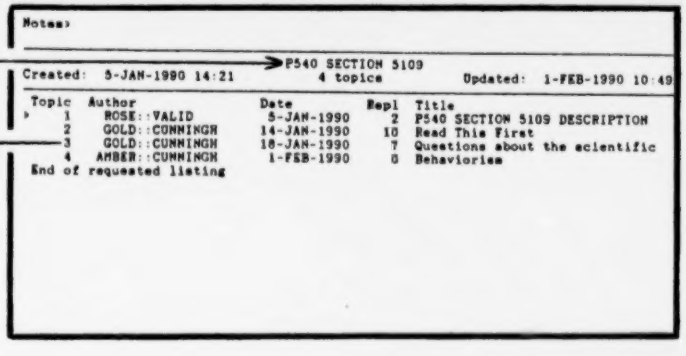
APPENDICES

LEVELS WITHIN THE ELECTRONIC CLASSROOM


AIE/EC2
Wed. Feb 14, 1990
Academic Information Environment
Electronic Classrooms 2
[1] A201 CSCI Springer (1687)
[2] C201 CSCI Springer (1704)
[3] E103 ECOM
[4] E800 ECOM Campbell
[5] Q200 EDOC (All Sections)
[6] B625 EDOC Bednar
[7] X150 EDOC Beverstock
[8] H300 EDOC Contreras
[9] P540 EDOC Cunningham
[10] P550 EDOC Cunningham
[11] W310 EDOC Gregory
[12] Next Menu
[H] Help [A] Addresses [U] Up [$] Command [K] Keywords
[?] Ask [M] Mail [B] Back [V] VMS [Q] Quit/Logout
[N] Next
Type 1-12, option, keyword >

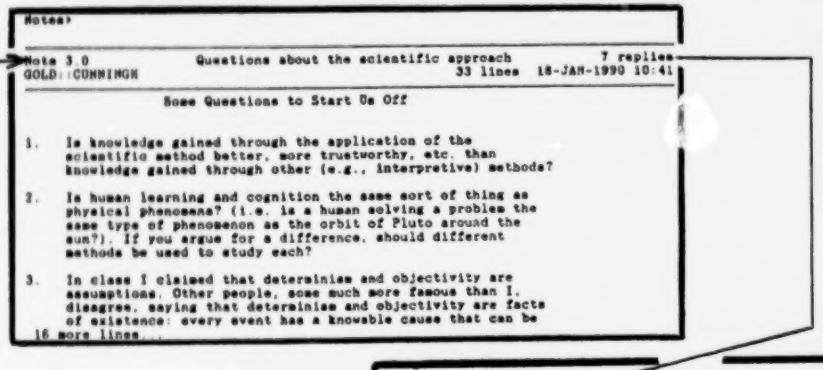
Level of existing e-classrooms

This level contains the menus of all existing e-classrooms. By typing the number in front of the course number, one chooses which e-classroom to enter. In this case, typing '9' will take you to Dr. Cunningham's course P540. You first have to add this classroom to your personal notebook of classes by typing: ADD ENTRY P540_5109 <RETURN>; and then: OPEN P540_5109 <RETURN>


Notes>
P540 SECTION 5109
Created: 5-JAN-1990 14:21 4 topics Updated: 1-FEB-1990 10:49
Topic Author Date Repl Title
1 ROSE::VALID 5-JAN-1990 2 P540 SECTION 5109 DESCRIPTION
2 GOLD::CUNNINGH 14-JAN-1990 10 Read This First
3 GOLD::CUNNINGH 18-JAN-1990 7 Questions about the scientific
4 AMBER::CUNNINGH 1-FEB-1990 0 Behaviorism
End of requested listing

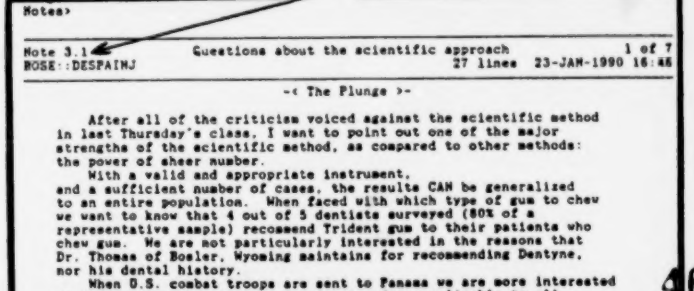
Level of topics in e-classroom

This level provides a general overview over all the topics in the selected classroom. To see this listing of topics, type: DIR <RETURN>


Notes>
Note 3.0 Questions about the scientific approach 7 replies
GOLD::CUNNINGH 33 lines 18-JAN-1990 10:41
Some Questions to Start Us Off
1. Is knowledge gained through the application of the scientific method better, more trustworthy, etc. than knowledge gained through other (e.g., interpretive) methods?
2. Is human learning and cognition the same sort of thing as physical phenomena? (i.e. is a human solving a problem the same type of phenomenon as the orbit of Pluto around the sun?). If you argue for a difference, should different methods be used to study each?
3. In class I claimed that determinism and objectivity are assumptions. Other people, some much more famous than I, disagree, saying that determinism and objectivity are facts of existence: every event has a knowable cause that can be
16 more lines...

Level of single topic

This is the upper level within the individual e-classroom. A zero behind the decimal point indicates a "topic." Topics are often questions by the instructor to the class. Moving across topics is done by simply typing the topic number desired.


Notes>
Note 3.1 Questions about the scientific approach 1 of 7
ROSE::DESPAINJ 27 lines 23-JAN-1990 16:46
-< The Plunge >-
After all of the criticism voiced against the scientific method in last Thursday's class, I want to point out one of the major strengths of the scientific method, as compared to other methods: the power of sheer number.
With a valid and appropriate instrument, and a sufficient number of cases, the results CAN be generalized to an entire population. When faced with which type of gum to chew we want to know that 4 out of 5 dentists surveyed (80% of a representative sample) recommend Trident gum to their patients who chew gum. We are not particularly interested in the reasons that Dr. Thomas of Bosler, Wyoming maintains for recommending Dentyne, nor his dental history.
When U.S. combat troops are sent to Panama we are more interested in information that is more pertinent and generalizable to all of us that we get from an NBC News/Wall Street Journal Poll concerning
12 more lines...

Level of replies to a topic

This is the lower of the two content levels in the e-classroom. Notes on this level are called "replies" because in many cases they are students' responses to a question (topic) raised by the instructor. Individual replies can be accessed by typing the topic number with the appropriate reply number behind the digit point. Further replies to a topic can be viewed by pressing <RETURN>.

APPENDIX B

Division of Development & Special Projects/AV Center
TEACHING CONFERENCE '90
COLLABORATIVE LEARNING IN HIGHER EDUCATION

Indiana Memorial Union/IUB

THURSDAY, OCTOBER 11

8:30 - 1:30	Registration: East Lounge
9:00 - 9:15	Welcome Address: **Kenneth Gros Louis** (IU Vice President & Chancellor)
9:15 -10:15	Keynote Speaker: **Faith Gabelnick** (Western Michigan Uni.) "What is collaborative learning and what is its potential at a large research university?"
10:15-10:30	COFFEE BREAK
10:30-11:15	**CONCURRENT SESSIONS I:**
S 1	Collaborative learning and teaching in physics Ben Brabson (Physics/IUB)
S 2	Collaborative learning in the writing program Anne Williams (English/IUPUI)
S 3	Workshop: Writing together JoAnn Campbell (English/IUB)
S 4	Training college students to collaborate Tom Gregory (Education/IUB)
S 5	Building on work and life experiences to teach management concepts Harvey Hegarty (Business/IUB)
S 6	Study guide, non-traditional teaching, and non-traditional students Miriam Hill (Geography, Geology/IUSE)
S 7	Collaborative discussion techniques useful across the curriculum Craig Nelson (Biology/IUB)

S 8	Finding the appropriate level of collaborative learning in a large lecture class in music theory Allen Winold (Music/IUB)
11:15-12:00	**CONCURRENT SESSIONS II:**
S 9	The chemistry lab: An effective vehicle for collaborative learning Wilmer Fife (Chemistry/IUPUI)
S 10	Collaboration in action: A video-look of freshman composition students collaborating Sharon Hamilton-Wieler (English/IUPUI)
S 11	A problem-solving curriculum for active learning at the Northwest Center for Medical Education Panayotis Iatridis (Medical School/IUNW)
S 12	Using collaborative learning to help promote conceptual change in science David Maloney (Physics/IPFW)
S 13	A collaborative research practicum between students and faculty: A model from Sociology Bernice Pescosolido (Sociology/IUB)
S 14	Making connections: Minority students and collaborative learning Laura F. Smith (English & Business/IUB) Gladys F. DeVane (Business/IUB)
S 15	Collaboration in collective bargaining: A computer simulation program David Spencer (Labor Studies/IUB)
S 16	Techniques for collaborative learning in literature Janet Streepey (English/IUSE)
12:00 - 1:30	L U N C H

1:30 - 2:45 **CONCURRENT PANELS:**

PANEL 1:	Collaborative Learning in difficult contexts such as large lectures
Moderators:	Jim Crowe (HPER/IUB) & Joe Waldman (Bus/IUB)
Panelists:	Leslie Bland (Physics/IUB)
	Bernardo Carducci (Psychology/IUSE)
	LoriLee Sadler (Computer Science/IUB)
	Helen Schwartz (English/IUPUI)

PANEL 2:	Collaborative Learning and small-group processes in seminars
Moderator:	Patricia Andrews (Communication/IUB)
Panelists:	William Browne (Beh. & Soc. Sci./IUE)
	Margaret Ann Dirkes (Education/IPFW)
	Sharon Hamilton-Wieler (English/IUPUI)
	Ray Russo (Biology/IUPUI)
	Susan Shepherd (Linguistics/IUPUI)

PANEL 3:	Collaborative Learning and writing across the curriculum
Moderator:	Jerome Harste (Education/IUB)
Panelists:	Mary Anne Baker (Sco. Sci./IUSE)
	Christine Farris (English/IUB)
	Kathryn Wilson (Biology/IUPUI)
	Gary Wyckoff (SPEA/IUB)

PANEL 4:	Student-organized Collaborative Learning
Moderator:	William Lynch (Education/IUB)
Panelists:	Mary Johnson (Business/IUB)
	Edward Robbins (Teacher Ed/IUPUI)
	Beth Berghoff (Education/IUB)
	Holly Gurney (English/IUB)
	Hester Hemmerling (Education/IUB)

2:45 - 3:00 C O F F E E B R E A K

3:00 - 4:00 Group Discussions (led by individual panel members with conference participants from their respective fields).

Topic:
"How can we address issues of (either: large classes, small groups, writing, or student-initiatives) in our field with collaborative learning?"

Each group will produce a policy statement about the topic that will be published and shared with other faculty and administrators in the IU system.

FRIDAY, OCTOBER 12

8:30 Registration

9:00-10:00 Speaker: **Linda Harasim**
(Simon Fraser University/Canada)
"Computer-mediated communication and collaborative learning."

10:00-11:00	**CONCURRENT SESSIONS I:**
S 1	Experiences with the Electronic Classroom/VAX Notes in different courses and by different instructors Sharon Pugh (Learning Skills Center/IUB) Kenichi Kubota (IST) Lori Hubbard (for SPEA/IUB) David Perry (for Special Education)
S 2	"GroupSystems" in the classroom: Using computers to support group planning Alan Heminger (Business/IUB) Jeffrey Hoffer (Business/IUB)
S 3	Applications and levels of support for computers in collaborative writing across the curriculum Helen Schwartz (English/IUPUI)
S 4	Hypertext as a medium for student collaboration Kenneth Davis (English/IUPUI)
S 5	"Roundtable:" A process tool to support collaborative reasoning David Goodrum (Education/IUB)
11:00-12:00	**CONCURRENT SESSIONS II:**
S 6	Supporting group decision making -- different time/ different place -- within a school system: The Linton-Stockton project Craig Glenn (Superintendent, Linton-Stockton school district) Joe Valacich (Business/IUB) Alan Heminger (Business/IUB)
S 7	Computer-delivered collaboration with a local area network Mary Sauer (English/IUPUI)
S 8	Is collaboration cheating? Collaborative exams in large classes Martha Kendall (Anthropology/IUB)
S 9	"The Electronic Classroom:" Hands-on experience Ray Foster (DDSP/IUB)

This conference is funded by a grant from:
THE TELECOMMUNICATIONS ADVANCEMENT FOUNDATION/JAPAN

APPENDIX C

An electronic conference about electronic conferencing
on the IUB "PRISM" Vaxes:

ECAL - "Electronic Classrooms for Active Learning"

The topics of this conference:

1. About this bulletin board
   (function and target audience for this conference)

2. Documents for E-Classroom use
   (job aids for VAX-Notes, conceptual papers, etc.)

3. Literature references
   (annotated references for collaborative uses of computer conferencing)

4. Technical help
   (questions, tips, and shortcuts re. VAX-Notes)

5. Advocacy issues
   (Suggestions, complaints, and strategies for improving e-conferencing at IU)

6. Planning for EC-use
   (Instructor experiences about how to plan their courses for
   EC-use)

7. The first two semester weeks
   (Instructors' experiences about they find useful to do with the EC during the initial semester weeks)

8. Familiarizing students with EC-technology
   (Instructors' procedures for how to train their students in using VAX-Notes)

9. E-Classroom architecture
   (Instructors' experiences and plans for the topic structures of their e-classrooms)

10. Collaborative EC-activities
    (Tasks and activities in the EC that instructors have found useful to increase interactions among their students)

11. Social support systems in the EC
    (Topics and activities in the EC that create a communicative and socially supportive classroom environment)

12. Integration with live class meetings
    (Instructor experiences of how to best integrate activities in the EC with the normal classroom)

13. Developing EC-use over semesters
    (Instructor experiences of how the use of the EC can be built up gradually over the course of several semesters)

14. Feedback and grading
    (Issues of giving feedback to users' EC-contributions or grading students' notes in the EC)

15. Workload increase and time savings
    (Instructors' experiences about what the use of the EC does to their class preparation, whether it increases or decreases prep. time in the long run)

16. What's happening elsewhere?
    (reports on what is done elsewhere in the U.S. or abroad with computer conferencing)

APPENDIX D
FACULTY SURVEY ON EC-USE:

(response options not chosen are eliminated from this summary)
(n=32)

1. How many topics did you create in your E-Classroom?
   a) up to 10: **9**
   b) more than 10: **18**

2. What function did the EC serve in the last course in which it was used?
   a) class announcements: **25**
   b) posting grades: **8**
   c) publishing class materials: **20**
   d) answering student questions: **19**
   e) topics for student discuss.: **19**
   f) student self introductions: **2**
   g) informal Coffee House: **1**
   h) discussion of research prop.: **1**
   i) access of CAI-lessons: **1**

3. How would you describe the teaching methodology used in conjunction with the use of the EC?
   a) discussion/class interaction: **16**
   b) individual discovery: **4**
   c) mostly lecture: **8**
   d) some lecture: **12**
   e) group work: **6**

4. How much time did you spend in preparation for the EC?
   a) less than 2 hrs/week: **17**
   b) 2-3 hrs/week: **6**
   c) more than 3 hrs/week: **3**

5. Have you received any ideas for your EC-use from any of the following:
   a) campus workshops: **15**
   b) ECAL VAX-Notes conference: **13**
   c) UCS workshops: **8**
   d) department activities: **4**
   e) talking to other professors: **13**
   f) looking at other EC's: **8**

6. What did/do you like most about EC (frequency of how often respondents ranked the following as #1 or #2):
   a) being able to post messages: **18**
   b) increased info flow bet. students & inst.: **23**
   c) helping students learn better: **8**

7. What did you like least about EC (frequency of how often respondents ranked the following as #1 or #2):
    a) technical/functional constraints: **18**
    b) training students to use it: **8**
    c) the time required to monitor it: **4**
    d) access to & slowness of VAXes: **16**
    e) lack of student response: **10**

8. Do you feel the use of the EC contributed to:
    a) a lot better student performance: **6**
    b) a little better student performance: **18**
    c) no change in student performance: **5**

9. How much initial training did your students receive:
    a) jump start classes: **12**
    b) outside workshops: **1**
    c) printed materials: **13**
    d) instruction from professor: **24**

10. Approximately what percentage of your class participated in the EC:
    a) less than 20%: **3**
    b) 40-80%: **6**
    c) 90-100%: **20**

11. Do you think that there was a positive relationship between use of the EC and:
    a) test performance: **4**
    b) overall grade: **5**
    c) ability to discuss course material in class: **11**
    d) argument development: **5**
    e) ability to appreciate multiple perspectives: **6**
    f) performance on written papers: **3**
    g) probably no significant impact: **4**

12. In what ways did the EC influence students' interactions:
    a) stud's w/ similar interests began working together: **4** (of 10)
    b) overall class cohesion increased: **4** (of 10)
    c) class participation increased: **5** (of 10)
    d) increase in positive group dynamics: **4** (of 10)

13. Were ideas expressed in the EC:
    a) more than in regular class: **5**
    b) of better quality: **4**
    c) better supported with evidence: **1**
    d) about the same as in regular class: **9**
    e) worse than in class: **2**

14. Approximately how many entries were made per week by students in the EC:
    a) less than 10: **20**
    b) more than 10: **6**

15. Will you use the EC next semester:
    a) for the same course: **19**
    b) for a different course: **3**
    c) for the same plus a different course: **4**
    d) never again: **5**
    e) undecided: **2**

16. If you answered 'a' to number 15:
    a) will you use it in the same way: **12**
    b) put more emphasis on the EC: **6**
    c) put less emphasis on the EC: **0**
    d) structure it differently: **2**
    e) don't know yet: **3**

17. Assuming that technical & logistical difficulties can be resolved, could you imagine that computer bulletin board systems could take on instructional functions such as (answer YES-MAYBE-NO):
    a) giving students more discussion initiative: **22-4-1**
    b) allowing student group projects: **20-6-2**
    c) putting more responsibil. for the course on students: **6-8-10**

18. How can the current EC system be improved so that it might gain significant importance in the teaching-learning process (frequency of how often respondents ranked the following as #1 or #2):
    a) it will never have more than administrative functions: **0**
    b) through more sophisticated software: **16**
    c) better student (& instructor) access to the system: **16**
    d) faster VAX response times: **9**
    e) more systematic student training: **10**
    f) instructors need conceptual models for EC use: **9**

19. Given that these improvements could be made, how much extra time per week would you be willing to spend to make this tool work optimally for your classroom?
    a) no extra time: **3**
    b) additional 1-2 hrs/week: **13**
    c) additional 3-5 hrs/week: **5**

APPENDIX E

QUESTIONNAIRE A200
Summary of Findings:
(total n=143)

USE OF E-MAIL:

69 (out of 141) students used e-mail to 50% or more for private purposes.

36 used it to 50% or more for communication with the instructor.

22 used it to 50% or more for school-related communication with other students.

- Only 4 used it mostly for job-related purposes, and 5 to 50% or more for mailing lists. (4 said "other", 2 did not answer at all).

FEELINGS ABOUT INSTRUCTORS' E-MAIL USE FOR THEIR COURSES:

63 (out of 143) students like e-mail as an option in their classes but don't use it much themselves.

51 want every instructor to use it extensively.

- Only 8 students consider it too much of a hassle, and another 8 don't care much about it (13 had "other" responses).

WRITING IN THE EC:

38 students had never written a response (out of the 143 taking the survey).

185 students out of the class total of 317 have never entered a comment under one of the nine topics.

READING THE EC:

50 students admitted to having read a response in the EC only twice over the course of the whole semester.

6 students said they had never even read a response in the EC.

MODE OF SELECTING AN EC-TOPIC:

60 students selected a topic by browsing through the EC.

31 selected simply the most recent one.

MODE OF READING EC-COMMENTS:

74 students browse through the comments of a given topic.

21 read only several of the first comments under a topic.

21 select the comments they want to read by directory.

REASON FOR READING COMMENTS:

the vast majority (ab. 90%) reads because of interest in the topic.

REASON FOR WRITING COMMENTS:

69 students write a response because of interest in the topic.
65 students write a response because they want the participation points.
28 of the previous 65 admit that they write for the participation points only.
32 students say they feel compelled to write if there is another response they disagree with.
26 students say they write to give another viewpoint (for instance, to play the devil's advocate).

BENEFITS OF EC:

57 students say they have learned from others' viewpoints.
38 say they don't think that it has helped them.
37 say the EC has helped them understand class discussions better.

LEAST LIKED ABOUT EC (some students checked more than one option):

73 students criticized that too many of the entries were redundant.
45 students complained about the problems in getting to a computer.
27 felt there was simply too much to read.
20 said that the topics did not really appeal to them.
16 complained that the organization of the system itself made it unpleasant to use.
11 preferred participating in person in class over using the computer.
5 said that they don't get much out of what other people have to say.

QUALITY OF IDEAS IN EC:

72 students felt that the ideas in the EC were about the same quality as in the classroom.
38 thought the quality was better in the EC.
121 thought EC comments were better supported by literature or other documents.

WOULD YOU USE IT AS A PROFESSOR?

102 students said they would use the EC in their classroom if they themselves were a college professor.

APPENDIX F

K205: LOGICAL ARGUMENTATION TEMPLATE

1. Identify the issue. An issue is a matter that is in dispute between two or more parties; a point of debate or controversy. If the case seems to contain more than one issue, identify the main one.

Example: Issue - Should pregnant, drug-addicted women who give birth to drug-addicted babies be charged with crime?

Example: Sub-issue (not the main issue) - Are our prisons too crowded?

2. Identify the two main positions on this issue which are presented in the case, and the individuals or groups which hold those positions. A position is an opinion or point of view held with regard to a particular issue. If more than two positions seem to be represented by a case, choose the two that you think are best represented.

Example: The Allen County prosecutor and a physician at Parkview Memorial Hospital have taken the position that the grand jury should consider charging these women with a crime. A physician at Lutheran Hospital holds the position that charging such women with crimes will only serve to keep them from seeking appropriate health care.

Do the next three steps for each of the two positions you have identified:

3. List the evidence presented in the case that seems to support the position. Evidence generally consists of facts or figures--not opinion or feelings.

Example: To support the position that the grand jury considering charging pregnant, drug-addicted women, the following statements are cited as evidence: "Nationwide, authorities estimate that about 400,000 babies are born annually addicted to drugs." And, "when... cocaine [is] smoked by pregnant women, the drug is passed through the bloodstream and to the developing fetus."

4. Give at least one example of missing evidence--evidence which might have been cited to support a position, but which was not cited.

Example: No evidence is cited to support the position that charging these women with a crime would prevent them from seeking health care. There may be some research studies which could be cited to help support this--or perhaps the opinion of someone who is an expert on providing health care to low-income people.

5. Indicate at least one value or belief-based assumption that seems to underlie the position. An underlying assumption is a value or belief that cannot be proved or disproved by facts. Often times, these assumptions are not directly stated in the text describing the case.

Examples: (1) "Unborn fetuses are living human beings and should have the same rights as others." (2) "Until it is born, a fetus is part of the mother's body and it does not have separate rights." (3) "Drug addiction is a disease, not a crime." (4) "Cocaine addicts are criminals and should be punished to the full extent of the law."

6. In your own words, state your own position on this issue. Indicate evidence, in the case or elsewhere, that supports your position. Indicate the value assumptions that underlie your position. Your position may be similar to one stated in the case, but don't just pick one from the case--put it in your own words.

Example: When pregnant, addicted women enter the health care system, I think they should be offered reproductive counseling and drug rehabilitation programs. If they refuse these, then prosecution should be considered. I can't really cite any evidence to support this position. My guess is that the threat of prosecution won't be much of a deterrent to either drug abuse (which is already a crime) or to pregnancy, so it makes sense to try rehab approaches first. Perhaps some evidence could be found to support this. I'm not too clear about what my value assumptions are. Probably I hold the basic assumption that drug addiction is a symptom of underlying social or psychological conditions, and that merely treating it as a crime is not the best way of dealing with it.

APPENDIX G

Results of the Student Background Questionnaire, Spring 1990
n = 96 replies

A. How would you describe your typing speed?

1. very slow	05
2.	20
3. medium	40
4.	29
5. very fast	02

B. Are you familiar with using a word processor?

1. not at all	11
2.	21
3. somewhat familiar	34
4.	22
5. very familiar	08

C. Do you use your IU-VAX computer account (GOLD, ROSE, AMBER, etc.)?

1. never	49
2. rarely	41
3. daily	06

D. Do you use electronic mail?

1. never	68
2. rarely	23
3. daily	05

E. Have you used VAX Notes (Electronic classroom)?

1. never	63
2. occasionally	30
3. often	03

F. Do you have your own computer?

1. Mac with modem	0
2. Mac	01
3. IBM or compatible with modem	01
4. IBM or compatible	02
5. Other computer	15
6. No computer	77

G. Have you ever used computer-based instruction (e.g., tutorials, simulation, educational games)?

1. never	11
2. occasionally	78
3. often	07

H. Have you ever kept a journal for personal or class purposes?

1. yes	74
2. no	22

I. How would you feel about journal writing as a course assignment? (e.g. reflecting on your feelings about thought-provoking issues from the course.)

1. I really would like to do it.	24
2. I would be willing to try it.	51
3. I do not know.	10
4. I would be reluctant to do it.	10
5. I would hate to do it.	01

J. Have you ever done collaborative work in another class?

1. I have done a lot of group work.	22
2. I have done some group work.	70
3. I have never worked in groups.	04

K. Do you like to work together with classmates?

1. I enjoy it.	57
2. I am willing to try it.	26
3. I do not know.	06
4. I dislike it.	07
5. I dislike it a lot.	00

L. We need volunteers for a two-hour block of time to participate in a group activity. We cannot pay you. Would you be willing to volunteer anyway?

1. Yes	36
2. No	60

M. Why do you like or dislike group projects or assignments?
(Please provide an answer in your own words.)

LIKE:

***** I like group work because it helps me to get to know more people on campus and in my class and it's usually a very rewarding and fun experience.

***** I feel learn more from talking and listening to peers than from sitting through lectures. I feel individuals grade as well as group grades shared be used.

***** I like group projects because I enjoy working with other people.

***** I like doing group work because it is easier on you when you have a group of people looking-up information in a variety of sources.

***** It's fun to get to know each other people and work with them. (3)

***** I like sharing ideas with others and accomplishing goals as a group. (2)

***** I like group projects because they seem to test your knowledge about issues in the course. Other members in the group may also suggest points I had not thought about.

***** I enjoy group projects or assignments because I can distribute the work in such a way that the burden would not be too great on each person. As long as I have the right kind of people (cooperative and nice). I enjoy that approach better than doing it all alone. (3)

***** I like group projects because it makes the task you are working on more fun and you usually get a lot of different new ideas when you are with some different people.

***** I like group project because it provides insight and understanding to how others view a particular subject matter. (16)

***** Group work gives students a chance to brainstorm and come up with ideas from different points of view, and by so doing, students can do a possible better job than on their own.

***** I like them because we are able to get feedback from our classmates, advice/suggestions from classmates. We also get to know people we may have never without working in a group. (4)

***** I like group projects because everyone is able to put their own input into the project. Therefore, many ideas can be put together. Everyone is able to learn from the others in their group. (6)

***** I like projects because you can work on them together and you usually get a better grade.

***** I like group projects. You get insight into other people's way of thinking. It makes one more open minded and help them ot work with people. It also helps you to appreciate different points of view.

***** Several input would be better than one or no ideas.

***** Group project keep you involved in class -- not just taking notes. There is a lot of brainstorming in group assignments takes a lot of pressure to find own idea. Group projects help bring a class closer together -- you get to know more people.

***** I enjoy working group for a number of reasons. First of all I think the feedback you get from everyone is great! You tend to learn a lot more because people may have a lot of different opinions. The other reason I like working is to get to meet new people. It is important through group work that everyone put forth an effort and sometimes this does not happen.

***** Like input of others in my class -- hearing what their views are about certain topics. It's

also good way to meet others and get to know them.

***** It provides a change of pace for normal classroom. You can also then compare yourself to others in the class.

***** Provide me with other ideas and thoughts. It's more fun to "think" in a group rather than being on your own all the time. We have plenty of chances to do solo assignments. It's a nice change of pace to do group assignment.

***** It also give individuals a chance to observe how people can adapt to new ideas that are posed to them.

***** It allows me to have "hands on" opportunities. One can learn from and this takes place in group activities.

DISLIKE:

***** It's awful if no one else will work.

***** I dislike it because no one really knows one another and unless you are a very forward or outspoken person not much is said and not many ideas are expressed truthfully.

***** May run into problems with allotting some work or getting some students to do their allotted work which can cause problems within the group.

***** I do not really like group projects because only a few people to the work for everyone. They most likely end up in gossip sessions also. (2)

***** I work better by myself because I want the job done with quality. I did not like to have to spend my time getting a person motivated to do the assignment. However, if someone is wanting to work hard and do a good job I would enjoy working with them. (2)

***** I am always frustrated when the other people won't do their part. (That they will forget or just not do it.) (3)

***** I do not like to depend on others to do work that I am going to get a grade on. There are times I have done most of the work just to make sure it was done correctly. I also have gotten a lower grade on a project that I could have gotten an A on had I done it by myself. (2)

***** I do not prefer to work with a group strictly because I have a tendency to work much faster or much slower than the average. I also have a tendency to have ideas that are deviant from the norm. From past experience, the group does not take the task as seriously as I would prefer.

OTHERS:

***** I usually prefer to work alone because some people are not dependable and if something goes wrong you can only blame yourself.

***** I dislike not having total control over something that is going to have my name on it. I enjoy input from other people.

***** If you work with a group on a project, you usually receive one grade for the group. I like to work in a group but get mine own grade, so I can do the project the way I think it should be done and not because I have to agree with a group.

***** You get to know people, brainstorm for ideas, arts of compromise, but on the other hand not everyone always pulls their own weight.

***** If the group is cooperative and agreeing, I like doing group project, somewhat I prefer to

work by myself though.

***** Group projects are good to do because you get a chance to use other people's insight but I also dislike them because there is always at least one free leader in the group. (5)

***** I would enjoy them once in a while, to help to get to know other classmates. I think if we constantly had them they would lose the importance of group projects to work with one another and not to have one person do it all.

***** I haven't really participated yet.

***** Groups assignments can be much more fun and educational than "going it alone", but it' hard because not all the individuals in a group are equally motivated and therefore some select few usually end up doing most of the work. (3)

***** I did not mind it.

***** Some people do not do their best. Some just do not give their fair share of input. Also, some students are concerned only with getting a "C" while there are others who know they can get an "A" on the project if they only apply themselves well enough! Group project can be good because students can learn from other students and interact about their ideas. (2)

***** I do not have a lot of the free time it would take for group projects. It would give me the opportunity to get to know other students in my class and it helps in learning when one gets the chance to discuss the issues with others, but all this does take extra time.

***** I enjoy group projects because I can learn from others and meet my peers. I am a very isolated person and groups help me to express myself. I dislike groups because as I stated I am isolated and sometimes I feel the need not to intervene with others.

***** I enjoy diversity of ideas and methods of a group, but someone who is too irresponsible, or introverted make a group situation unenjoyable.

***** I enjoy group projects as long as everyone in the group participates and cooperates, otherwise it is not fair. (3)

***** Often times the same people get stuck with the majority of the work. Therefore when grading comes all five people get an "A" for the work of three. But I do like getting a group perspectives and ideas.

***** I like group when all are willing to share intelligible ideas, but I would sometimes rather to work by myself because I do not like to depend on other people and I know I will do the work.

***** I like group projects because they allow you to meet many more people. It makes the work more fun. However, there are difficulties in finding a time for everyone to meet.

***** Sometimes they are beneficial, especially if you pick your group and they are people you know. But often it seems if you do not know the people, you really do not want to depend on their work as part of your grade. Also, sometimes in a group people do not do their share.

APPENDIX H

QUESTIONNAIRE S315 - Summary of Findings: (total n=40)

LIKED MOST IN CLASS:

13 guest lecturers
9 lectures
9 project
7 written class materials
5 groups outside of class
2 groups in class
1 class discussions
1 EC for test questions
1 EC for weekly topics

HAD PREVIOUS CLASSES WITH GROUP WORK:

26 yes
14 no

WOULD TAKE ANOTHER EC CLASS:

12 yes
21 maybe
7 no

MEETING FOCUSED ON TEST:

31 yes
5 no
4 no comment

LIKED MOST ABOUT STUDY GROUP:

19 getting to know some people in class
11 gaining a deeper understanding of the content
3 improved my grade

LIKED LEAST ABOUT STUDY GROUP:

18 no negative points
9 difficult to arrange meeting times
8 too time-consuming
3 some were taking advantage of others'
2 unproductive group

LIKED MOST ABOUT EC:

16 test preparation
7 getting info from instructor
6 learning from other people's perspectives
3 being able to express my opinion
3 getting to know something about other people in class

LIKED LEAST ABOUT EC:

11 too time consuming
9 too much work for too little payoff
4 not enough time to think about appr. responses
3 duplicated group work
3 too much information

COMPUTER ACCESS:

23 no significant difficulties
13 often had to wait to get to a computer
4 had to make extra trips to campus

BEST WAY TO TEACH THIS CLASS:

10 improve current system without major changes
7 use study groups only
7 reduce EC to test preview only
6 let students choose whether to use EC or study groups
3 use EC only
2 reduce EC to instructor messages only
2 other
1 don't use EC nor study group
1 missing
0 reduce EC to other topics only

WHAT DID THIS CLASS GENERALLY DO FOR YOU?

25 more (enjoyable) contacts with classmates
23 more involved in content
21 did better on tests than usual
15 learned a new way of studying
14 had more fun than in other classes
14 had more stress than in other classes
7 grading was less objective than in other classes

VAX-NOTES COMMANDS USED FREQUENTLY OR VERY OFTEN:

32 DIR
22 reply filename
19 dir 7.*
15 print/q=
12 dir/unseen/all
11 next/unseen
8 last unseen
3 add keyword
3 download
3 upload
2 extract
1 show keywords/full

APPENDIX I

Summary Table of Student Questionnaires

	S315 n=40	A n=22	A200 n=143	B n=36	C n=46	D n=20	K205 n=112	E n=49
USE OF E-MAIL PER WEEK:		in percentages						
not at all				0	2		61	12
twice a week				8	37		27	49
more than twice				36	26		12	12
every day				56	36		2	27
FUNCTION OF E-MAIL USE:		in percentages						
with instructor			28	62	28	65	25	23
with fellow students			18	17	16	35	13	12
private			48	14	39		50	46
job related			3	2	9		2	8
mailing lists			3	5	9		10	11
LIKE E-MAIL:		in percentages						
very much				56	45	25	17	39
much			(39)	42	38	45	14	31
undecided			48	2	6	25	35	22
not			(12)	0	6	5	25	4
not at all				0	4	0	9	4
LIKE EC:		in percentages						
very much				22	17	5	4	16
much	(29)	(29)		44	40	40	14	24
undecided	51	62		28	17	30	29	35
not	(20)	(9)		3	13	10	32	14
not at all				3	13	15	21	10
LIKE MOST ABOUT EC:		in percentages						
knowing other people	7	5				15		14
get info from prof	17	14		89	15	55	14	39
express my opinions	7	27			4			12
multiple perspectives	15	23			17		3	16
prepare for tests	40			8				10

LIKE LEAST ABOUT EC:	in percentages							
clumsy software				3	11			
too time-consuming	27	41		8	4	15	1	20
too diffi. to learn	22			25	11	5	16	10
info overload	7	4	19		2		1	18
little time to think	10	14						16
duplicates stdy grps	7	4						10
redundant comments			51				1	
bad organization			11				4	
unappealing topics			14					
depersonal interact.			8	5	4			
diffi. comp. access	32	27	31	11		25	4	27
extra trips to campus	10	50				20	6	10
system failures				3				
system too slow					4			
LIKE GROUP WORK:	in percentages							
meet other people	48							
prepare for tests	7							
deeper understanding	27							
PREVIOUS E-MAIL USE:	in percentages							
required to use it				42	28		26	47
not required to use				58	72		74	53

	S315	A
MOST USED EC-COMMANDS:	in percentages	
dir	80	36
reply filename	55	23
dir 7.*	47	36
print/q=	37	4
dir/unseen/all	30	23
next/unseen	27	9
last unseen	20	13
add keyword	7	4
download	7	0
upload	7	0
extract	5	4
show keywords/full	2	4